

Project Manual

## Construction Documents

# Raytown Central Middle School Renovation and Addition

10601 E 59<sup>th</sup> Street  
Raytown, MO 64133

Prepared For:  
**Raytown Quality Schools**  
6608 Raytown Road  
Raytown, MO 64113

HM Project No: 21011  
Issue Date: November 2021

### **Contents:**

Volume 1: Introductory Information, Bidding and Contracting Requirements,  
Division 12.

Volume 2: Division 23 through Division 32.



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## **SECTION 000101 - PROJECT TEAM DIRECTORY**

### **PART 1 - GENERAL**

#### **1.1 PROJECT TEAM INFORMATION**

##### **A. PROJECT:**

1. Name: Raytown Central Middle School Renovation/Addition
2. Location: 10601 E 59th Street , Raytown , Missouri 64133
3. Project No: 21011

##### **B. OWNER:**

1. Name: Raytown Quality Schools
2. Address: 6608 Raytown Road, Raytown , Missouri 64113
3. Contact: Josh Hustad / Director of Facility Operations
4. Phone: 816.268.7000

##### **C. ARCHITECT:**

1. Name: Hollis + Miller Architects, Inc.
2. Address: 1828 Walnut Street, Suite 922, Kansas City, MO 64108.
3. Contact: Sandy Cochran
4. Email: scochran@hollisandmiller.com
5. Phone: 816.442.7700 / Fax: 816.599.2545

##### **D. CIVIL ENGINEER:**

1. Name: MKEC Engineering, Inc.
2. Address: 11827 W 112th Street, Suite 200, Overland Park, Kansas 66210.
3. Contact: Phillip Henning
4. Email: phenning@mkec.com
5. Phone: 913.317.9390.

##### **E. STRUCTURAL ENGINEER:**

1. Name: Hollis + Miller Architects, Inc.
2. Address: 1828 Walnut Street, Suite 922, Kansas City, MO 64108.
3. Contact: Vanessa Peterson
4. Email: vpeterson@hollisandmiller.com
5. Phone: 816.442.7700 / Fax: 816.599.2545

##### **F. MEP ENGINEER:**

1. Name: RTM Engineering

2. Address: 9225 Indian Creek Parkway, #1075, Overland Park, Kansas 66210
3. Contact: Brian Hentz
4. Email: brian.hentz@rtmec.com
5. Phone: 913.322.1400

G. ACOUSTICIAN:

1. Name: Avant Acoustics
2. Address: 14827 West 95th Street, Lenexa, Kansas 66215.
3. Contact: John Hodgson
4. Email: jhodgson@avantacoustics.com
5. Phone: 913.888.9111.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 000101

**SECTION 000105 - CERTIFICATIONS PAGE**

ARCHITECT

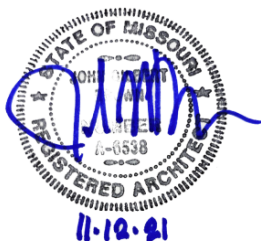
I HEREBY, PURSUANT TO RSMO 327.411, STATE THAT THE SPECIFICATIONS INTENDED TO BE AUTHENTICATED BY MY SEAL ARE LIMITED TO SPECIFICATIONS LISTED BELOW:

DIVISION 1 SECTIONS:	011000, 012200, 012300, 012500, 012600, 012900, 013100, 013200, 013233, 013300, 014000, 014200, 014529, 015000, 016000, 017300, 017419, 017700, 017823, 017839, 17900.
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DIVISION 14 SECTIONS:	NA.
DIVISION 31 SECTIONS:	NA.
DIVISION 32 SECTIONS:	NA.
DIVISION 33 SECTIONS:	NA.

I HEREBY DISCLAIM ANY RESPONSIBILITY FOR ALL OTHER SPECIFICATIONS, DRAWINGS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE ARCHITECTURAL OR ENGINEERING PROJECT OR SURVEY.

\_\_\_\_\_  
ARCHITECT

\_\_\_\_\_  
DATE



**CERTIFICATION PAGE**

STRUCTURAL ENGINEER

I HEREBY STATE, PURSUANT TO RSMO 327.411, THAT THE SPECIFICATIONS INTENDED TO BE AUTHENTICATED BY MY SEAL ARE LIMITED TO SPECIFICATIONS LISTED BELOW:

DIVISION 3 SECTIONS:	033000, 033523.
DIVISION 4 SECTIONS:	042000.
DIVISION 5 SECTIONS:	051200, 052100, 053100, 054000, 054400.
DIVISION 6 SECTIONS:	061000, 061600.
DIVISION 32 SECTIONS:	NA.

I HEREBY DISCLAIM ANY RESPONSIBILITY FOR ALL OTHER SPECIFICATIONS, DRAWINGS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE ARCHITECTURAL OR ENGINEERING PROJECT OR SURVEY.

\_\_\_\_\_  
STRUCTURAL ENGINEER

\_\_\_\_\_  
DATE



**SECTION 000105 - CERTIFICATIONS PAGE**

MEP ENGINEER

I HEREBY, PURSUANT TO RSMO 327.411, STATE THAT THE SPECIFICATIONS INTENDED TO BE AUTHENTICATED BY MY SEAL ARE LIMITED TO SPECIFICATIONS LISTED BELOW:

DIVISION 23 SECTIONS:	230500	COMMON WORK RESULTS FOR HVAC
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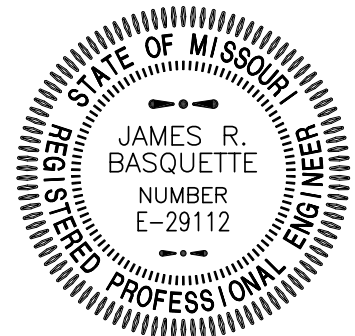
I HEREBY DISCLAIM ANY RESPONSIBILITY FOR ALL OTHER SPECIFICATIONS, DRAWINGS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE ARCHITECTURAL OR ENGINEERING PROJECT OR SURVEY.

**James Basquette**

Digitally signed by James Basquette  
 DN: C=US, E=jimbasquette@yahoo.com, O=RTM Engineering  
 Consultants, CN=James Basquette  
 Date: 2021.11.04 08:45:38-05'00'

MEP ENGINEER

DATE







**CERTIFICATION PAGE**

ACOUSTICAL CONSULTANT

I HEREBY STATE, THAT THE SPECIFICATIONS UNDER MY RESPONSIBILITY ARE LIMITED TO SPECIFICATIONS LISTED BELOW:

DIVISION 27 SECTIONS:	274116
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I HEREBY DISCLAIM ANY RESPONSIBILITY FOR ALL OTHER SPECIFICATIONS, DRAWINGS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE ARCHITECTURAL OR ENGINEERING PROJECT OR SURVEY.

  
ACOUSTICAL CONSULTANT

NOVEMBER 12, 2021  
DATE



**CERTIFICATION PAGE**

CIVIL ENGINEER

I HEREBY STATE, PURSUANT TO RSMO 327.411, THAT THE SPECIFICATIONS INTENDED TO BE AUTHENTICATED BY MY SEAL ARE LIMITED TO SPECIFICATIONS LISTED BELOW:

DIVISION 31 SECTIONS	311000 & 312000
DIVISION 32 SECTIONS	321313 & 321373

I HEREBY DISCLAIM ANY RESPONSIBILITY FOR ALL OTHER SPECIFICATIONS, DRAWINGS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE ARCHITECTURAL OR ENGINEERING PROJECT OR SURVEY.

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CIVIL ENGINEER            \_\_\_\_\_

DATE



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10601 E. 59<sup>th</sup> Street  
Raytown, MO 64133

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## SECTION 001100 - INVITATION TO BID

### PART 1 - GENERAL

#### 1.1 PROJECT INFORMATION

- A. Notice to Bidders: Prequalified bidders are hereby invited to submit bids for the Central Middle School Renovation / Addition project. Bids shall be fully executed, signed and sealed in envelopes as described in this Document according to the Instructions to Bidders and as amended by the Supplementary Instructions to Bidders.
- B. Project Identification: 21011 - Raytown Central Middle School Renovation/Addition
1. Project Address: 10601 E 59th Street , Raytown, Missouri 64113
- C. Owner: **Raytown Quality Schools**
1. Owner's Address: 6608 Raytown Road , Raytown, Missouri 64113
  2. Owner's Representative: Josh Hustad , Director of Facility Operations, 816.268.7160.
- D. Architect:
1. Architect's Address: Hollis + Miller Architects, Inc., 1828 Walnut Street, Suite 922, Kansas City, MO 64108
  2. Architect's Representative: Sandy Cochran. Telephone: 816.442.7700
- E. Project Description: Work of Project is defined by the Contract Documents and consists of the following: Limited demolition work and civil, architectural, mechanical, electrical and plumbing work associated with interior renovations, building addition and finish upgrades as set forth in the Contract Documents.
- F. Construction Contract: Bids will be received for the following Work:
1. General Contract (all trades).
- G. Bidders are advised that the School District is tax exempt pursuant to Sections 144.030.2 and 144.615, RSMo. The School District will furnish the successful Bidder with current copies of their Missouri Project Exemption certificate and Missouri Tax Exemption Letter. The Contractor will review Paragraph 3.6.2 of Supplementary Conditions regarding taxes.
- H. Bidders are further advised that a Prevailing Wage Determination prepared by the Missouri Division of Labor Standards is in effect on this project and is included in this Project Manual. Provisions of Section 290.262 CUM, Supp RSMo (2000) shall apply to this Project.
1. The Annual Wage Order No. 28, Section 048 (Jackson County ), as filed with the Secretary of State, is attached hereto and made part of this Specification.

#### 1.2 BID SUBMITTAL AND OPENING

- A. Owner will receive sealed bids until the bid time and date at the location indicated below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:

1. Bid Date: Thursday, December 7, 2021.
  2. Bid Time: **2:00 p.m.** local time.
  3. Location: Raytown Quality Schools, Facility Operations Office, 5911 Blue Ridge Blvd, Raytown, MO 64133.
- B. Bids will be thereafter publicly opened and read aloud. Bids received after the bid time listed above will be returned to the Bidder unopened.
- C. The bidding procedure shall be in accordance with all applicable provision of Missouri law, including but not limited to Mo. Rev, Statue. 177.086.
- D. Bids shall not contain any recapitulation of the work to be done. No oral, telegraphic or telephonic proposals for modifications will be considered.

### 1.3 BID SECURITY

- A. Bid security shall be submitted with each bid of \$5,000 or greater in the amount of 5 percent of the bid amount, including all additive alternates and made payable to the Owner. No bids may be withdrawn for a period of 60 days after opening of bids.
1. Owner reserves the right to reject any and all bids and to waive informalities and irregularities.
- B. All Bid Securities will be retained by the Owner until an Agreement is signed and a satisfactory Performance and Payment Bond is received by the Owner.

### 1.4 PREBID CONFERENCE

- A. A prebid conference for all bidders will be held at the Raytown Quality Schools, Facility Operations Office, 5911 Blue Ridge Blvd, Raytown, MO 64133. Prospective bidders are encouraged to attend.
1. Pre-Bid Conference: Monday, November 29th, 2021 at 2:00 pm (Local Time).
  2. Touring of the job site to determine the extent of demolition and conditions under which work will be conducted will be critical to all Bidders (General Contractors and Subcontractors). Coordinate site tours through Josh Hustad at 5911 Blue Ridge Blvd, Raytown, MO 64133, phone 816.268.7160, email [josh.hustad@raytownschools.org](mailto:josh.hustad@raytownschools.org). As school is currently in session, bidders are strongly encouraged to schedule tours outside of school hours. Bidders are advised that if tour must be scheduled during school hours, bidder visit will be limited to those spaces not in use at time of tour.

### 1.5 DOCUMENT PROCUREMENT

- A. Printed Procurement and Contracting Documents: Obtain after 3:00 pm. on November 15th, 2021 by contacting the KC Blueprint Company and Planroom, 1804 Swift Street, North Kansas City, Missouri 64116, telephone 816.527.0900. Only complete sets of documents will be issued.
1. Cost: Contact KC Blueprint Company.
  2. Shipping: Additional shipping charges of will apply. Contact reprographic house for amount.

B. Online Procurement and Contracting Documents: Obtain access after 3:00 pm. on November 15th, 2021 by contacting KC Blueprint Company and Planroom (<http://planroom.kcblueprint.com/>). Online access will be provided to all registered bidders and suppliers.

C. Plans and specifications will also be available at the following locations for review only at no cost to the Contractor:

1. Hollis + Miller Architects, Inc. 1828 Walnut Street, Suite 922, Kansas City, MO 64108. Phone: (816) 442-7700
2. Builder's Association, 632 West 39th Street, Kansas City, MO 64111-2991.
3. Dodge/Scan, 1702 Broadway Blvd., Kansas City, MO 64108. Phone (816) 221-1056
4. Minority Contractors Association, 3200 Wayne Street, Kansas City, MO 64108. Phone: (816) 924-4441

D. A current list of Contractors holding plans will be made available through KC Blueprint Company and Planroom.

#### 1.6 TIME OF COMPLETION AND LIQUIDATED DAMAGES

A. Time is of the essence for this project. Bidders shall begin the work on receipt of the Notice to Proceed and shall achieve Substantial Completion as set forth hereinafter. **Work may commence after school is out for the summer, approximately May 31, 2022 or sooner with written approval by the Owner.**

1. Substantial Completion for Interior Renovation work: July 29, 2022.
2. Substantial Completion for Building Addition work: July 28, 2023.
3. Final Completion for Interior Renovation work: August 5, 2022.
4. Final Completion for Building Addition: August 4, 2023.
5. Bidders are advised that the Agreement will contain a stipulated date of Substantial Completion, an incentive bonus for early completion of the project and provision for the assessment of liquidated damages for each day the Work is not complete beyond the designated date of Final Completion.
6. Bidders are further advised that the Agreement will contain an "Incentive Bonus" in the event that the General Contractor achieves Substantial Completion of all Work earlier than the time stipulated. The bonus incentive does not apply to authorized adjustments made to the Contract Time during the course of construction, unless such delays are caused by the Owner. Incentive Bonus will be for a maximum of ten (10) days prior to the dates established for Substantial Completion for an amount of \$1,000.00 per day.

B. Liquidated Damages for substantial completion will be assessed if the general contractor has not achieved adequate progress to permit school district personnel occupancy and use of all noted areas of the building and/or site in accordance with the dates for substantial completion noted above. Damages will accrue and will be based on the unavailability of the building space(s) and/or site for their intended purposes as determined by the school district. Liquidated damages noted are tiered and are based on the intended use of the building and/or site in accordance with the school schedules proposed or established.

1. Final completion of construction related activities including the satisfactory completion of all punchlist corrections shall be completed in accordance with the timeframe noted above for each building and/or area. Liquidated damages associated with final completion shall be assessed based on any actual cost incurred by the school district due to the restricted use of the facility; and for costs that may be associated with inconvenience, lack of efficiency, and/or district personnel costs associated with providing exclusive access for the general contractor to complete punchlist corrections after normal school day operation and/or on weekends or holidays. Similarly, any actual costs incurred by the school district for extended or additional architect/engineer services made necessary as a result of the general contractor's inability to meet final completion will be assessed as liquidated damages to the general contractor.
- C. Bidders shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within the Contract Time. Work is subject to liquidated damages in the **amount of \$1,000 per day** if project is delayed beyond the contracted completion date.

#### 1.7 BIDDER'S QUALIFICATIONS

- A. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work. A Performance Bond, a separate Labor and Material Payment Bond, and Insurance in a form acceptable to Owner will be required of the successful Bidder.
- B. Each Contractor desiring to Bid this work must have a minimum of seven (7) years continuous experience under the current company name and must submit the "Contractor's Qualification Statement", AIA Document A305 along with Bid. This Qualification Statement is available at the Office of the American Institute of Architects (AIA) at 1801 McGee Street, Kansas City, Missouri 64108, telephone: (816) 221-3485. The Architect will review the Qualification Statement with the Owner. The Owner has the right to take such steps as he deems necessary, to determine the ability of the Contractor to perform the work. The Contractor shall furnish to the Owner such additional information and data for this purpose as he may request. The right is reserved to reject any Bid, or Bidder, after an investigation or consideration of the information submitted by such Contractor. Refer to Document 004513.
- C. Owner reserves the right to reject any Contractor and Contractor's Proposal where investigation or consideration of the information submitted by the Contractors does not satisfy the Owner that the Bidder has previous experience in performing similar or comparable work, sufficient business and technical organization, financial resources and plant available to perform the Work.

#### 1.8 SUPPLEMENTAL REQUIREMENTS

- A. The selected Bidder shall, within fifteen (15) days after Award of the Contract, submit the following Post-Bid information:

1. A statement of costs of the major portions of the work included in the Bid and any specific item of cost requested.
  2. A designation of the Work to be performed by the Bidder with his own forces.
- B. The selected Bidder shall, submit the following with the Bid:
1. A list of names of the Subcontractors, manufacturers, fabricators, and material suppliers or other persons or organizations proposed for each principal portion of the Work as may be designed by the Architect. The Bidder will be required to establish to the satisfaction of the Owner and Architect the reliability and responsibility of the proposed persons or entities to furnish and perform their Work. Prior to the contract, if the Owner or Architect has a reasonable and substantial objection to any person or entity on such list, and refused in writing to accept such person or entity, the bidder may, at his option, withdraw his Bid without forfeiture of Bid Security. If the Bidder submits an acceptable substitute with any increase in his Bid price to cover the difference in cost occasioned by such substitution, the Owner may, at his discretion, accept the increased Bid price or he may disqualify the Bidder. Subcontractors and other persons and entities proposed by the bidders and accepted by the Owner and Architect must be used on the work for which they were proposed and accepted and shall not be changed except with the written approval of the Owner and the Architect.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF DOCUMENT 01100



## **SECTION 002100 - INSTRUCTIONS TO BIDDERS**

### **PART 1 - GENERAL**

#### **1.1 DOCUMENTS**

- A. A copy of the American Institute of Architects Document A701, Instructions to Bidders 2018 Edition, is bound hereinafter as amended by Document 002200 – Supplementary Instruction to Bidders. This Document is included for information only and may not be duplicated.
- B. Additional copies of the Instructions to Bidders may be obtained, at cost, from the Local Chapter, of the American Institute of Architects, at the address listed below:
  - 1. AIA Kansas City
    - a. Address: 1801 McGee, Suite 100, Kansas City, Missouri 64108
    - b. Telephone: (816) 221-3485.
    - c. Website: [www.aiakc.org](http://www.aiakc.org)
  - 2. AIA Mid Missouri
    - a. Address: P. O. Box 1622, Columbia, Missouri 65205
    - b. Website: [www.aiamid-missouri.com](http://www.aiamid-missouri.com)
- C. Additional copies of the Instructions to Bidders may also be obtained, at cost, from the website of the American Institute of Architects, at the internet address listed below:
  - 1. Website: <http://www.aia.org/contractdocs/index.htm>

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 002100





**SECTION 004200 - BID PROPOSAL**

**PART 1- GENERAL**

**1.1 DECLARATION OF BID PROPOSAL**

A. Proposal of \_\_\_\_\_ (hereinafter called "Bidder"), organized and existing under the laws of the State of \_\_\_\_\_, doing business as (a corporation) / (a partnership) / (an individual) (circle one) to the Board of Education, Raytown Quality Schools of Raytown, Missouri (hereinafter called "Owner").

**1.2 BID PROPOSAL**

A. In compliance with your Advertisement for Bids, Bidder hereby proposes to perform all work for the Raytown Quality Schools Central Middle School Renovation/Additioning Upgrades in strict accordance with the Contract Documents, within the time set forth herein and at the prices stated below. Bidder should propose on individual base bids for specific project locations as noted below. Owner will award contract per individual base bid.

B. The Bidder hereby understands that time is of the essence on this project and is aware of the following critical completion dates:

	<b>SUBSTANTIAL COMPLETION</b>	<b>FINAL COMPLETION</b>
Raytown Quality Schools Central MS Interior Renovation	29 JULY 2022	5 AUGUST 2022
Raytown Quality Schools Central MS Addition	28 JULY 2023	4 AUGUST 2023

C. The Bidder hereby understands that Liquidated Damages for the delay in completions shall be \$1,000.00 per calendar day.

1. Bidders are further advised that the Agreement will contain an "Incentive Bonus" in the event that the General Contractor achieves Substantial Completion of all Work earlier than the time stipulated. The bonus incentive does not apply to authorized adjustments made to the Contract Time during the course of construction, unless such delays are caused by the Owner. \$1,000/day for up to 10 days; Maximum of 10 days.

D. By submission of this Bid, each Bidder certifies, and in the case of a joint Bid each party thereto certifies as to its own organization, that this Bid has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this Bid with any other Bidder or with any competitor.

E. Bidder acknowledges receipt of the following ADDENDA: \_\_\_\_\_.

F. The undersigned, having familiarized itself with local conditions affecting the cost of the work at the place where the work is to be done and with all Bidding Documents, including the Instructions to Bidders, Plans and Specifications, General and Supplementary Conditions, the Standard Form of Agreement and the other Contract

Documents, and having examined the location of the proposed work and considered the availability of labor and materials, hereby proposes and agrees to perform everything required to be performed, and to provide and furnish any and all labor, materials, supervision, necessary tools, equipment, and all utility and transportation service necessary to perform and complete in a workmanlike and timely manner all of the work required for the project, all in strict conformance with the Instructions to Bidders and other Contract Documents (including Addenda noted above, the receipt of which is hereby acknowledged), for the lump sums hereinafter specified.

1.3 TOTAL BASE BID:

A. Bidder agrees to perform all the work described in the Contract Documents for Raytown Central Middle School Interior Renovation and Addition for the lump sum total of:

B. \_\_\_\_\_ Dollars and \_\_\_\_\_ cents.

C. \$ \_\_\_\_\_.

1.4 BASE BID BREAKDOWN:

A. The above "Total Base Bid" shall be broken down as noted below for Owner's accounting purposes and to allow Owner to review the proposed price for the Addition separately:

Interior Renovation work (all renovation work)	\$ _____
Building Addition	\$ _____

1.5 AMOUNTS FOR UNIT PRICES:

A. Bidder propose to base adjustments in the Contract Sum, if ordered by Architect during the Contract Time, on the unit prices listed below. These prices constitute full compensation or credit for the complete provision and installation for each item listed based solely on Work in place. The Unit Prices as stated include all necessary appurtenances and connections required to complete the Work in place, insurance, overhead, profit, and superintendence.

Unit Price No. 1 Masonry Repair	\$ _____ / (SF)
Unit Price No.2: Additional Polished Concrete at Existing VCT Locations	\$ _____ / (SF)
Unit Price No. 3: Lean Concrete	\$ _____ / (SF)
Unit Price No. 4: Concrete removal and replacement	\$ _____ / (SF)
Unit Price No. 5: Asphalt Overlay and Sealcoat	\$ _____ / (SF)

1.6 AMOUNTS FOR ALTERNATES:

A. Bidder proposes to furnish all materials, labor, plant and appurtenances called for by the above documents for the alternates for the following sums and to allow for the Owner a period of sixty (60) days from the date of Contract Award to accept or reject the Alternates without change in the Alternate Amount or contract Time. Circle "Add" or "Deduct" as it applies for each Alternate.

Alternate No. 1: Lighting Controls	\$ _____ (Add / Deduct)
Alternate No. 2: Corridor Flooring	\$ _____ (Add / Deduct)


1.7 COMPLETION OF THE WORK

A. If we are notified of the acceptance of the Base Bid of this Proposal within ninety (90) days after the above date, we agree to execute a Contract for the above Work, for the above stated compensation in the form of the Standard Agreement Between Owner and Contractor, AIA Document A101-2017, of the American Institute of Architects, as modified by Owner.

1.8 TAX EXEMPTION:

A. This project shall be considered Tax Exempt. Federal, State and local taxes shall not be included with the Bid. Subsequent to the award of the construction contract, the School District will obtain from the State of Missouri , a sales tax exemption certificate number. The sales tax exemption certificate will permit the Contractor to purchase materials for incorporation into this project without paying sales tax, provided that the Contractor furnishes the certificate number to the material supplier.

1.9 CHANGES IN THE WORK:

A. Changes in the Work shall be as established in the Contract Documents. The Undersigned agrees that his net fees shall set forth below, include Overhead, Profit, and General Requirements (including but not limited to; insurance and bonds.) The following fees shall be used for Lump Sum pricing and actual cost pricing of additions and deletions to that work included in the Bid, namely:

	<b>Profit &amp; Overhead</b>	<b>Not To Exceed</b>
To Contractor for work performed by his/her own forces.	_____ %	5%
To Contractor for work performed by other than his/her own forces.	_____ %	5%
To Subcontractor for work performed by his/her own forces.	_____ %	5%
To Subcontractor for work performed other than his/her own forces.	_____ %	5%

1.10 SUBCONTRACTORS

A. The bidder hereby certifies that the following subcontractors will be used in the performance of the work on each or both projects. ALL General Contractors MUST furnish a copy of their proposed Sub-Contractor List by 4:00 PM CDT on bid day to be considered as valid. If not submitted at the time of Bidding, the list may be delivered, emailed (scochran@hollisandmiller.com) to the A/E offices, but must be received by no later than the time listed above.

1.11 BID SECURITY

A. Bidders whose Bid includes both labor and materials and whose Base Bid amount is \$5,000.00 or greater, agrees to and has attached hereto a Bid Bond for the amount of five percent (5%) of the amount of the Bid submitted.

- B. This Bid Security is to be left in escrow with the Architect. If the Undersigned defaults in executing the Agreement within three (3) days of written notification of the award of the Contract to him, or in furnishing the Performance Bond within fourteen (14) days thereafter, the Bid Security will become the property of the Owner and will be delivered to him by the Architect. If the Undersigned executes and delivers the Agreement and Bond within the time specified, or if the Base Bid of this Proposal is not accepted within sixty (60) days of the time set for submission of Bids, the Bid Security shall be returned to the Contractor upon delivery of a receipt therefore.
- C. If the Undersigned defaults in executing and delivering the above-named Agreement and the required performance Bond, the Owner would sustain liquidated damages for five percent (5%) of the amount of the Bid submitted, the measure of which is the amount of the accompanying Bid Bond, Certified Check, or Cashier's Check, payable to "Raytown Quality Schools".

1.12 ACKNOWLEDGEMENTS

- A. The undersigned further acknowledges that the he has familiarized himself with local conditions affecting the cost of the work at each place where the work is to be done.
- B. In submitting this bid, the undersigned agrees:
  - 1. To furnish all material, labor, tools, expendable equipment, and all utility and transportation services necessary to perform and complete, in a workmanlike manner, all the work required in accord with the bid documents.
  - 2. To hold this bid open for ninety (90) days after the receipt of bids and to accept the provisions of the instructions to bidders regarding disposition of bid security.
  - 3. To commence the work upon receipt of Notice to Proceed, and to substantially complete the work not later than the dates set forth on the Invitation to Bid. (see specifications)
  - 4. To accept the assessment of liquidated damages as noted for each calendar day following the substantial completion dates listed above. (see specifications)
  - 5. All materials to be non-proprietary, as specified, or approved equal as noted in specifications.
- C. In submitting this bid, it is understood that the right to reject any and all bids and to waive irregularities in this bidding has been reserved by the Owner.

1.13 SIGNATURES

- A. Signature: \_\_\_\_\_
- B. Printed Name: \_\_\_\_\_
- C. Title: \_\_\_\_\_
- D. Company Name: \_\_\_\_\_
- E. Address: \_\_\_\_\_

- F. Phone: \_\_\_\_\_
- G. Email: \_\_\_\_\_
- H. Seal: - (if BID is by a corporation)



## **SECTION 004313 - BID SECURITY FORM**

### **PART 1 - GENERAL**

#### **1.1 PROPOSAL FORM SUPPLEMENT**

- A. A completed bid bond form is required to be attached to the Proposal Form.

#### **1.2 BID BOND FORM**

- A. The Form of the bid security shall be American Institute of Architects (AIA), Document A310 – 2010 “Bid Bond”. A copy of the Bid Bond form is bound hereinafter for information only and may not be duplicated.
- B. Additional copies of the Bid Bond may be obtained, at cost, from the Local Chapter, of the American Institute of Architects, at the address listed below:
  - 1. AIA Kansas City
    - a. Address: 1801 McGee, Suite 100, Kansas City, Missouri 64108
    - b. Telephone: (816) 221-3485.
    - c. Website: [www.aiakc.org](http://www.aiakc.org)
  - 2. AIA Mid Missouri
    - a. Address: P. O. Box 1622, Columbia, Missouri 65205
    - b. Website: [www.aiamid-missouri.com](http://www.aiamid-missouri.com)
  - 3. AIA Missouri
    - a. Address: 204 East High Street, Jefferson City, Missouri 65101
    - b. Telephone: (573) 635-8555
    - c. Website: [www.aiamo.org](http://www.aiamo.org)
- C. Additional copies of the Bid Bond may also be obtained, at cost, from the website of the American Institute of Architects, at the internet address listed below:
  - 1. Website: <http://www.aia.org/contractdocs/index.htm>

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION (NOT USED)**

**END OF SECTION 004313**





## **SECTION 004513 - CONTRACTOR'S QUALIFICATION STATEMENT**

### **PART 1 - GENERAL**

#### **1.1 CONTRACTOR'S QUALIFICATION STATEMENT**

- A. The form of the Contractor's Qualifications shall be American Institute of Architects (AIA) Document A305 – 1986 "Contractor's Qualification Statement". A copy of the Contractor's Qualification Statement is bound hereinafter for information only and may not be duplicated.
1. Contractors are to provide a minimum of three references of major projects completed within the past five years. Refer to paragraph 3.5 of AIA Document A305.
- B. Additional copies of the Contractor's Qualification Statement may be obtained, at cost, from the Local Chapter, of the American Institute of Architects, at the address listed below:
1. AIA Kansas City
    - a. Address: 1801 McGee, Suite 100, Kansas City, Missouri 64108
    - b. Telephone: (816) 221-3485.
    - c. Website: [www.aiakc.org](http://www.aiakc.org)
  2. AIA Mid Missouri
    - a. Address: P. O. Box 1622, Columbia, Missouri 65205
    - b. Website: [www.aiamid-missouri.com](http://www.aiamid-missouri.com)
  3. AIA Missouri
    - a. Address: 204 East High Street, Jefferson City, Missouri 65101
    - b. Telephone: (573) 635-8555
    - c. Website: [www.aiamo.org](http://www.aiamo.org)
- C. Additional copies of the Contractor's Qualification Statement may also be obtained, at cost, from the website of the American Institute of Architects, at the internet address listed below:
1. Website: <http://www.aia.org/contractdocs/index.htm>

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 004513



## **SECTION 005200 - AGREEMENT FORM**

### **PART 1 - GENERAL**

#### **1.1 OWNER AND CONTRACTOR AGREEMENT**

- A. The form of the agreement shall be American Institute of Architects (AIA) Document A101 – 2017, “Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum”. The “agreement” is included by reference.
- B. A copy of AIA Document A101 – 2017 may be obtained, at cost, from the Local Chapter, of the American Institute of Architects, at the address listed below:
  - 1. AIA Kansas City
    - a. Address: 1801 McGee, Suite 100, Kansas City, Missouri 64108
    - b. Telephone: (816) 221-3485.
    - c. Website: [www.aiakc.org](http://www.aiakc.org)
  - 2. AIA Mid Missouri
    - a. Address: P. O. Box 1622, Columbia, Missouri 65205
    - b. Website: [www.aiamid-missouri.com](http://www.aiamid-missouri.com)
  - 3. AIA Missouri
    - a. Address: 204 East High Street, Jefferson City, Missouri 65101
    - b. Telephone: (573) 635-8555
    - c. Website: [www.aiamo.org](http://www.aiamo.org)
- C. Copies of AIA Document A101 – 2017 may also be obtained, at cost, from the website of the American Institute of Architects, at the internet address listed below:
  - 1. Website: <http://www.aia.org/contractdocs/index.htm>
- D. Attachments to the Section:
  - 1. Draft of AIA A101-2017.
  - 2. Draft of AIA A101-2017 Exhibit A.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 005200



## **SECTION 006113 - PERFORMANCE AND PAYMENT BOND**

### **PART 1 - GENERAL**

#### **1.1 PERFORMANCE BOND AND PAYMENT BOND**

- A. The forms for the bonds shall be American Institute of Architects (AIA) Document A312 - 2010, "Performance Bond and Payment Bond". A copy of each of the bonds is bound hereinafter for information only and may not be duplicated.
- B. Additional copies of the performance bond and payment bond may be obtained, at cost, from the Local Chapter, of the American Institute of Architects, at the address listed below:
  - 1. AIA Kansas City
    - a. Address: 1801 McGee, Suite 100, Kansas City, Missouri 64108
    - b. Telephone: (816) 221-3485.
    - c. Website: [www.aiakc.org](http://www.aiakc.org)
  - 2. AIA Mid Missouri
    - a. Address: P. O. Box 1622, Columbia, Missouri 65205
    - b. Website: [www.aiamid-missouri.com](http://www.aiamid-missouri.com)
  - 3. AIA Missouri
    - a. Address: 204 East High Street, Jefferson City, Missouri 65101
    - b. Telephone: (573) 635-8555
    - c. Website: [www.aiamo.org](http://www.aiamo.org)
- C. Additional copies of the performance bond and payment bond may also be obtained, at cost, from the website of the American Institute of Architects, at the internet address listed below:
  - 1. Website: <http://www.aia.org/contractdocs/index.htm>

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 006113



## **SECTION 006273 - APPLICATION AND CERTIFICATION FOR PAYMENT**

### **PART 1 - GENERAL**

#### **1.1 APPLICATION AND CERTIFICATION FOR PAYMENT**

- A. The Form of the Application and Certificate for Payment shall be AIA Document G702 – 1992 “Application and Certification for Payment” and G703 – 1992 “Continuation Sheet. A copy of each form is bound hereinafter for information only and may not be duplicated.
- B. Additional copies of AIA Document G702 and AIA Document G703 may be obtained, at cost, from the Local Chapter, of the American Institute of Architects, at the address listed below:
  - 1. AIA Kansas City
    - a. Address: 1801 McGee, Suite 100, Kansas City, Missouri 64108
    - b. Telephone: (816) 221-3485.
    - c. Website: [www.aiakc.org](http://www.aiakc.org)
  - 2. AIA Mid Missouri
    - a. Address: P. O. Box 1622, Columbia, Missouri 65205
    - b. Website: [www.aiamid-missouri.com](http://www.aiamid-missouri.com)
  - 3. AIA Missouri
    - a. Address: 204 East High Street, Jefferson City, Missouri 65101
    - b. Telephone: (573) 635-8555
    - c. Website: [www.aiamo.org](http://www.aiamo.org)
- C. Additional copies of AIA Document G702 and AIA Document G703 may also be obtained, at cost, from the website of the American Institute of Architects, at the internet address listed below:
  - 1. Website: <http://www.aia.org/contractdocs/index.htm>

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 006273





**SECTION 006275 - PARTIAL LIEN WAIVERS**

PART 1 - GENERAL

1.1 PARTIAL LIEN WAIVER

- A. Reference that certain Agreement between \_\_\_\_\_, as Contractor, and Raytown Quality Schools of Raytown, Missouri in Jackson County County as Owner, dated on the Project know as: Raytown Central Middle School Renovation/Addition, Project No. 21011 , for work to be performed by said Contractor.
- B. Reference also that certain Invoice (s) No(s). \_\_\_\_\_ of Contractor to said Owner in the amount of \$ \_\_\_\_\_ for work, labor, and materials installed in or furnished for said Project as of \_\_\_\_\_, 20\_\_\_\_.
- C. Upon receipt of the Owner's remittance for the amount of said invoice(s) and contingent upon the final clearance and payment of said remittance, Contractor agrees to and does hereby waive and release said property, Project and Owner from any and all liens, statutory or otherwise, for any and all work, labor and materials furnished by or through \_\_\_\_\_ Contractor on said Project to and including the work, labor, and materials covered by said above numbered invoice(s) except for unpaid retainage.
- D. The remittance of the Owner's identified as payment of said above numbered invoice(s) as endorsed by Contractor marked "paid" or otherwise canceled by the bank against which said remittance was drawn shall constitute conclusive proof that said Invoice(s) were paid and that payment thereof was received by Contractor and this lien waiver shall become effective automatically and without requirement of any further act, acknowledgement or receipt on the part of the Contractor named herein.

DATED THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_\_\_.

\_\_\_\_\_  
BY

\_\_\_\_\_  
TITLE

NOTARY SEAL (BELOW)

\_\_\_\_\_  
NOTARY PUBLIC

SUBSCRIBED AND SWORN TO BEFORE ME WITHIN AND FOR

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

ON THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_\_\_

MY COMMISSION EXPIRES: \_\_\_\_\_

END OF SECTION 006275



RECEIPTED AND ACKNOWLEDGED BY:

\_\_\_\_\_

CONTRACTOR / SUPPLIER (BAILEE)

ON THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_\_\_

END OF SECTION 006276

**SECTION 006277 - BILL OF SALE**

**PART 1 - GENERAL**

**1.1 BILL OF SALE**

A. Seller:

- 1. \_\_\_\_\_, Subcontractor or Supplier
- 2. \_\_\_\_\_, Address
- 3. \_\_\_\_\_, City, State Zip

B. In consideration of payments made pursuant to its Contract with Raytown Quality Schools of Raytown , Missouri in Jackson County County as Owner, Buyer, dated \_\_\_\_\_ , 20\_\_ for the Project known as Raytown Central Middle School Renovation/Addition, receipt of which is hereby acknowledged, Seller does hereby grant, sell, transfer, and deliver to Buyer right, title, and interest in the following goods:

C. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

D. Buyer shall have all rights and title to the goods in himself and his executors, administrators and assigns. Seller is the lawful owner of the goods and the goods are free from all encumbrances. Seller has good right to sell the goods and will warrant and defend the right against the lawful claims and demands of all persons. It is expressly understood and agreed that the acceptance of the goods described herein is not a waiver of any right of action that the Buyer may have for breach of warranty of any other cause under the Contract referenced above or at law.

E. In Witness Whereof, Seller has executed this Agreement the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

F. Seller: \_\_\_\_\_ (subcontractor, supplier)

G. By: \_\_\_\_\_

H. Title: \_\_\_\_\_

ASSIGNMENT OF BILL OF SALE

\_\_\_\_\_, IN CONSIDERATION OF  
PAYMENTS MADE BY \_\_\_\_\_, OWNER, PURSUANT TO ITS CONTRACT  
DATED \_\_\_\_\_, 20\_\_\_\_ FOR THE PROJECT KNOWN AS

\_\_\_\_\_ DOES HEREBY  
ASSIGN THIS BILL OF SALE TO OWNER.

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATE: \_\_\_\_\_

END OF DOCUMENT 006277

## **SECTION 007200 - GENERAL CONDITIONS**

### **PART 1 - GENERAL**

#### **1.1 APPLICABLE DOCUMENTS**

- A. The American Institute of Architects Document A201, "General Conditions of the Contract for Construction", 2017 Edition, is part of the Contract Documents and is included by reference, as amended by Document 007300 "Supplementary Conditions".
- B. Copies of the General Conditions may be obtained, at cost, from the Local Chapter, of the American Institute of Architects, at the address listed below:
  - 1. AIA Kansas City
    - a. Address: 1801 McGee, Suite 100, Kansas City, Missouri 64108
    - b. Telephone: (816) 221-3485.
    - c. Website: [www.aiakc.org](http://www.aiakc.org)
  - 2. AIA Mid Missouri
    - a. Address: P. O. Box 1622, Columbia, Missouri 65205
    - b. Website: [www.aiamid-missouri.com](http://www.aiamid-missouri.com)
  - 3. AIA Missouri
    - a. Address: 204 East High Street, Jefferson City, Missouri 65101
    - b. Telephone: (573) 635-8555
    - c. Website: [www.aiamo.org](http://www.aiamo.org)
- C. Copies of the General Conditions may also be obtained, at cost, from the website of the American Institute of Architects, at the internet address listed below:
  - 1. Website: <http://www.aia.org/contractdocs/index.htm>

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 007200





## SECTION 008100 - PREVAILING WAGE DETERMINATION

### PART 1 GENERAL

#### 1.1 PREVAILING WAGE DETERMINATIONS

- A. This Project is contracted under the requirements of Missouri Prevailing Wage Law. This Section includes general information and forms for convenience. Detailed requirements, information, forms, and assistance may be obtained by contacting the following:
1. Missouri Department of Labor and Industrial Relations Division of Labor Standards Prevailing Wage Section PO Box 449 Jefferson City, MO 65102-0449 Phone: 573-751-3403 Fax: 573-751-3721 Email: [prevailingwage@labor.mo.gov](mailto:prevailingwage@labor.mo.gov) Website: [www.labor.mo.gov/lis/prevailingwage](http://www.labor.mo.gov/lis/prevailingwage)
  2. Contractor shall be responsible for obtaining the latest information and rates regarding the Missouri Prevailing Wage Law, including but not limited to incremental increases, issued on or before the date of bids.
  3. Additional information regarding Missouri Law and Statutes can be found at the Revisor of Statutes for the State of Missouri at <http://revisor.mo.gov>.
    - a. Prevailing Hourly Rate of Wages: Not less than the prevailing hourly rate of wages, as set out in the wage order attached, must be paid to all workers performing work under this Contract.
  4. Contractor shall forfeit a penalty to the contracting public body of \$100 per day (or portion of a day) for each worker that is paid less than the prevailing rate for any work done under this Contract by the Contractor or by any Subcontractor.
  5. Submit certified copies of Contractor's and subcontractor's payrolls to contracting public body on a weekly basis.
    - a. Safety Training Program: All on-site employees, including those of Contractor and subcontractors, are required to complete the ten-hour safety training program required under Section 292.675 RSMo, if they have not previously completed the program and have documentation of having done so.
  6. Contractor shall forfeit a penalty to the contracting public body of \$2500 plus an additional \$100 for each employee, including those of subcontractors, for each calendar day, or portion thereof, such employee is employed without the required training.
    - a. Construction Transient Employers: Every transient employer, as defined in section 285.230 RSMo, must post in a prominent and easily accessible place at the site, a clearly legible copy of the notices listed below. Any transient employer failing to comply with these requirements shall, under section 285.234 RSMo, be liable for a penalty of \$500 per day until notices are posted as required by the statute:
  7. The notice of registration for employer withholding issued to such transient employer by the director of revenue.
  8. Proof of coverage for workers' compensation insurance or self-insurance signed by transient employer and verified by the Department of Revenue through records of the Division of Workers' Compensation.

9. The notice of registration for unemployment insurance to such transient employer by the Division of Employment Security.

- a. Posting of Wage Rates: While work under this Contract is being performed, a legible list of all prevailing wage rates must remain posted in a prominent and easily accessible location at the site by the Contractor and each subcontractor on the project. Such notice shall remain posted during the full time that any worker is employed on the project.
- b. Project Notification - Contractor Information Notification: Before performing any Work, submit a completed PW-2 Form "Prevailing Wage Project Notification - Contractor Information Notification," available at [www.labor.mo.gov/lis/prevailingwage](http://www.labor.mo.gov/lis/prevailingwage) under "Forms," to The Division of Labor Standards (DLS).
- c. Project Completion Notification – Affidavit of Compliance: Before final payment will be made, the Contractor shall file a fully executed affidavit, PW-4 Form "Affidavit – Compliance with the Prevailing Wage Law", available at [www.labor.mo.gov/lis/prevailingwage](http://www.labor.mo.gov/lis/prevailingwage) under "Forms," to The Division of Labor Standards (DLS).
- d. Monthly Applications for Payment: Pursuant to prevailing wage laws, an Affidavit of Compliance (Form PW-4) must be filed with the District before payment will be approved. The District will withhold and retain any amounts due as a result of any violation of the prevailing wage law prior to making payment with any contractor. Include Affidavit of Compliance with each application for payment.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 008100

**SECTION 008400 - ATTACHMENTS**

PART 1 - GENERAL

1.1 APPLICABLE AFFIDAVITS AND FORMS

- A. The electronic verification of work authorization, "E-Verify" form is bound hereinafter for Contractor's duplications and use.
- B. The OSHA "Affidavit of 10 Hour OSHA Training" is bound hereinafter for Contractor's duplication and use.
- C. "Contractor's Affidavit Concerning Drug/Alcohol Testing Program" form is bound hereinafter for Contractor's duplication and use.
- D. The "Missouri Service-Disabled Veteran Business Preference" form is bound hereinafter for Contractor's duplication and use.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 008400



## SECTION 011000 - SUMMARY

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Coordination with occupants.
5. Work restrictions.
6. Specification and drawing conventions.
7. Miscellaneous provisions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

#### 1.2 PROJECT INFORMATION

A. Project Identification: Raytown Central Middle School Renovation/Addition

1. Project Address: 10601 E 59th Street, Raytown, Missouri 64133.

B. Owner: **Raytown Quality Schools**

1. Owner's Representative: Josh Hustad / Director of Facility Operations
2. Refer to Document 000105 "Project Team Directory."

C. Architect: Hollis + Miller Architects, Inc.

1. Architect's Address: 1828 Walnut Street, Suite 922, Kansas City, MO 64108
2. Architect's Representative: Sandy Cochran.

D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Refer to Document 000105 "Project Team Directory."

#### 1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. General: All demolition, sitework, architectural, structural, fire suppression, plumbing, mechanical, electrical, access control, technology and utilities for the interior renovation work and the new building addition as indicated in the Contract Documents and as further defined in the Scopes of Work.
2. Alternates: Refer to Section 012300 "Alternates".

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.4 WORK BY OWNER

- A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.
- B. Preceding Work: Owner will remove certain items from the Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.

1.5 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Limits: Confine construction operations to areas indicated and as directed by Architect and Owner.
  2. Driveways, Walkways, and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Restrictions: Note that no deliveries to the Project Site will be allowed between the hours of 7:00 am to 8:30 am and 2:00 pm to 3:30 pm.
      - 1) Alternate operating hours as reviewed with the Owner.
    - b. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    - c. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.6 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
  2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.7 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise indicated.
1. Weekend Hours: Coordinate and schedule all weekend hours with the Owner not less than 48 hours in advance. Comply with regulations of authorities having jurisdiction.
  2. Early Morning Hours: Notify Owner of days when early morning hours will be required and comply with regulations of authorities having jurisdiction.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
1. Notify Architect and Owner not less than three (3) days in advance of proposed utility interruptions.
  2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
1. Notify Architect and Owner not less than three (3) days in advance of proposed disruptive operations.
  2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Nonsmoking Buildings and Sites: Smoking is not permitted on School District property.
- F. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.
- G. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- H. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
1. Maintain list of approved screened personnel with Owner's representative.
  2. As a condition for the award of any service contract in excess of \$5,000.00 by the Owner, the service provider must be enrolled in and currently participating in "E-Verify" or any other equivalent electronic verification of work authorization program operated by the U.S. Department of Homeland Security.
  3. As a further condition for the award of any service contract in excess of \$5,000.00 the service provider shall not knowingly employ any person who is an un-authorized alien in conjunction with the contracted services.
    - a. E-Verify forms are available for duplication and contractor's use in Section 008400 – Attachments.

#### 1.8 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as

follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
  3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 011000



## **SECTION 012200 - UNIT PRICES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
  - 1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
  - 2. Section 014000 "Quality Requirements" for general testing and inspecting requirements.

#### **1.2 DEFINITIONS**

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

#### **1.3 PROCEDURES**

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes (other than sales and use tax), overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

### **PART 2 PRODUCTS (NOT USED)**

### **PART 3 EXECUTION**

#### **3.1 SCHEDULE OF UNIT PRICES**

- A. Unit Price No. 1: Masonry Repair
  - 1. Description: Provide all labor, materials, equipment and and appurtenances necessary to provide masonry repair at areas determined by Architect and Owner. General requirements for masonry repair included in this unit price may be found in Section 040100 "Masonry Restoration and Cleaning."
    - a. General cleaning of masonry shall be included in base bid requirements and not by unit price. Refer to Section 042000 "Unit Masonry" for cleaning requirements covered in base bid.
  - 2. Unit of Measurement: Square feet of masonry repair as indicated above under this unit price.

B. Unit Price No. 2: Additional Polished Concrete at Existing VCT Locations

1. Description: Provide all labor, materials, equipment and appurtenances necessary to provide additional polished concrete surfacing at existing VCT locations. Unit price shall include the demolition and removal of existing VCT flooring and all concrete grinding required to remove residual VCT adhesive patterning in concrete as determined by Architect and Owner.
2. Unit of Measurement: Square feet of additional polished concrete flooring area.

C. Unit Price No. 3: Lean Concrete

1. Description: Unit price per square foot - required for areas requiring build-up of turf fall zones.
2. Note: General Contractor to coordinate with play structure supplier/owner on fall height zone locations and compliance requirements.
3. Unit of Measurement: Square Foot.

D. Unit Price No. 4: Concrete Removal and Replacement.

1. Description: Removal and off-site disposal of concrete and subsequent placement of new concrete to a thickness of 6 inches according to Sections 321313 "Concrete Paving and Section 321378 "Concrete Paving Joint Sealants.
2. Unit of Measurement: Square Foot.

E. Unit Price No. 5: Asphalt Edge Mill and Overlay

1. Description: Edge mill asphalt paving and provide 2 inch thick asphalt overlay according to Section 321216 "Asphalt Paving."
2. Unit of Measurement: Square Foot.

END OF SECTION 012200

## **SECTION 012300 - ALTERNATES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for alternates.

#### **1.2 DEFINITIONS**

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

#### **1.3 PROCEDURES**

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

### **PART 2 PRODUCTS (NOT USED)**

### **PART 3 EXECUTION**

#### **3.1 SCHEDULE OF ALTERNATES**

- A. Alternate No. 1: Lighting Controls.
  - 1. ADD Alternate: Alternate includes all labor, materials, equipment and appurtenances necessary to provide all lighting controls except those indicated as Alternate 1. This includes: occupancy sensors, wall switches, power packs, room controllers, daylight sensors and all demolition associated with lighting controls shown on plans.

2. Base Bid: All existing light switches to remain. All fixtures indicated as "new" will reuse existing room circuiting and controls unless noted to be modified where inboard/outboard lighting controls is used with the existing fluorescent fixtures.

B. Alternate No. 2: Corridor Flooring.

1. DEDUCT Alternate: Provide all labor, materials, equipment and appurtenances necessary to remove VCT in areas where existing concrete floor is heavily patched, lay new VCT flooring instead of grinding and polishing concrete. Sections for VCT replacement will be identified and verified by Architect and the Owner.
2. Base Bid: After VCT removal, grind and polish existing concrete floor in corridors and vestibules as noted on Drawings and as specified in Section 033523..

END OF SECTION 012300

## **SECTION 012500 - SUBSTITUTION PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for "Substitutions for Convenience" and "Substitutions for Cause".
- B. Related Requirements:
  - 1. Section 012200 "Unit Prices" for products selected under a unit price.
  - 2. Section 012300 "Alternates" for products selected under an alternate.
  - 3. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
  - 4. Division 02 through 33 Sections for specific requirements and limitations for substitutions.

#### **1.2 DEFINITIONS**

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms. Substitutions for Cause shall be submitted after award of the contract as set forth hereinafter.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner. Substitutions for Convenience shall be submitted prior to bidding as set forth hereinafter.
- B. Comparable Products: Naming of specified items on the Drawings and in the specifications, means that such named items are specifically required by the Architect and/or Owner. When the words "or comparable product" follows such named item(s), a substitution request must be submitted when proposing a product other than the named product. Requests for substitutions must be received by the Architect within the time frame set hereinafter.
- C. The following are not considered substitutions:
  - 1. Revisions to Contract Documents requested by the Owner or Architect.
  - 2. Specified options of products, materials and construction methods included in the Contract Documents.

#### **1.3 ACTION SUBMITTALS**

- A. Substitution Requests: Submit at least one (1) paper copy or an electronic pdf copy of each request for consideration to the Architect. Clearly Identify proposed product and related options or fabrication or installation method to be replaced. Include Specification Section number and title, in addition to applicable Drawing numbers

and titles.

1. Substitution Request Form: Use facsimile of form provided at the end of this Section.
  - a. Accompanying each Substitution Request shall be a fully executed copy of the Substitution Request Form.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
  - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
  - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
  - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Specifically indicate deviations, if any, from the Work specified in writing.
  - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
  - e. Samples, where applicable or requested, of proposed substitution and of specified product shall be submitted for comparison and review by Architect.
  - f. Certificates and qualification data, where applicable or requested.
  - g. List of similar installations for completed projects with project names and addresses and names, addresses and contact information of architects and owners.
  - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
  - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Review Process: Submittal requests for proposed substitutions will be processed using the following procedures:
  - a. Submittals will be "Received Dated" immediately upon arrival.
  - b. Submittals will be placed by receiving person in a file designated for that purpose.
  - c. Submittals will not be reviewed for completeness or compliance until after the date and time established for closing of receipt of substitution request submittals.
  - d. Submittals will be reviewed by a member of Hollis + Miller Architect's staff (or respective consultant). Reviewer(s) will not be designated until after closing period established for receipt of submittals.
  - e. Reviewer's General Attitude will be:
    - 1) Burden of Proof is on Proposer.
    - 2) Reviewer should not be required to complete the submittal, that is, select from options or between models and lines of products.
    - 3) Reviewer should not be required to conduct an exhaustive review of the submittal. Submittals of manufacturer's catalogs which do not clearly indicate proposed product and proposed product options will be rejected.
    - 4) Reviewer should not be required to seek information from manufacturer's literature on file in the office, from an improperly submitted electronic submittal or information in other locations.
    - 5) Substitute must be "comparable to" or superior in those features and performance which the Project requires and those which the specified product will provide.
    - 6) Review is complete when, in the reviewer's opinion, significant deficiency(ies) are established. In such case, review of data covering other points of specifications is not required.
  - f. Reviewer will note action taken (No Exception taken to Submitted Manufacturer, No Exception taken to Specific Product, Exceptions Noted, Not Accepted or Received Late), the date, and his/her initials.

- g. All submittals received after closing time will be "Received Dated", marked "Late", initialed by reviewer, and filed without review.
  - h. Submittals will be filed in Architect's office until completion of the Project.
4. Architect's Action:
- a. Architect will review requests for "Substitutions for Convenience" only once, no additional information may be submitted. Architect may request additional information as necessary for review of "Substitutions for Cause."
  - b. Architect will note action taken.
  - c. Architect is not obligated nor required to review any and all substitution requests.
  - d. Architect is not obligated to inform proposers of substitutions of incomplete and non-accepted requests for substitution.
  - e. Acceptance of Substitutions:
    - 1) Acceptance of Substitutions for Convenience: Accepted substitutions will be set forth in an Addendum and in no other manner.
      - (a) Use product specified if Architect does not issue a decision on use of a proposed substitution.
    - 2) Acceptance of Substitutions for Cause: Architect will review proposed substitution within 15 business days of receipt of request. If necessary, Architect, will request additional information or documentation for evaluation within seven (7) business days of receipt of a request for Substitution for Cause." Architect will notify Contractor of acceptance of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later. **Only acceptable substitutions will receive notification of status. Substitutions shall be considered unacceptable unless a form of acceptance is received by the Proposer.**
      - (a) Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
      - (b) Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

#### 1.4 ELECTRONIC SUBMITTAL OF SUBSTITUTIONS

- A. Substitution Request submittals will be accepted for review when submitted electronically under the following conditions. Substitution requests which are not submitted in accordance with the criteria listed below may be rejected at the Architect's discretion.
- 1. Accompanying each submittal shall be a fully executed copy of the Substitution Request Form.
  - 2. Submittals shall be sent to Hollis + Miller Architects, to the attention of the contact listed in Document 000101 "Project Team Directory. Submittals directed to the attention of anyone other than the contact listed will not be considered.
  - 3. Submittals of Substitutions for Cause must be received within the time limits set forth in Paragraph 2.1 A of this Section.
  - 4. Submittals of Substitutions for Convenience must be received prior to bidding and within the time limits set forth in Paragraph 2.1 B of this Section.
  - 5. Documentation requirements as set forth in 1.3 A.2a through 1.3 A.2m are applicable to electronic submittals.
    - a. Note: Electronic submittals in which the manufacturer's entire catalog is submitted will be rejected.

#### 1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by

manufacturers.

## 1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions at no additional cost to the Owner.

## PART 2 - PRODUCTS

### 2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than thirty (30) days prior to time required for preparation and review of related submittals.
1. Conditions: Architect and Owner will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - b. Request is directly related to a "or comparable product" clause or similar language in the Contract Documents.
    - c. Specified product or method of construction cannot be provided within the Contract Time.
    - d. Specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
    - e. Specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution will provide the specified warranty.
    - f. Substitution request is fully documented and properly submitted.
    - g. Requested substitution will not adversely affect Contractor's construction schedule.
    - h. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - i. Requested substitution is compatible with other portions of the Work.
    - j. Requested substitution has been coordinated with other portions of the Work.
    - k. Requested substitution provides specified warranty.
    - l. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution only when submitted prior to bidding, and no later than 4:00 p.m. (local time) eight (8) calendar days prior to the date established for receipt of bids. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    - b. Requested substitution does not require extensive revisions to the Contract Documents.
    - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - d. Substitution request is fully documented and properly submitted.
    - e. Requested substitution will not adversely affect Contractor's construction schedule.
    - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - g. Requested substitution is compatible with other portions of the Work.
    - h. Requested substitution has been coordinated with other portions of the Work.



- i. Requested substitution provides specified warranty.
  - j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- C. The Contractor's submittal and A/E's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptance or validate request for substitution, nor does it constitute approval.
- D. Under no circumstances does the Architect's and/or Owner's acceptance of any such substitution relieve the Contractor from timely, full and proper performance of the Work.

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012500



**SECTION 012500.01 - SUBSTITUTION PROCEDURES FORM**

**MAIL TO:** HOLLIS + MILLER ARCHITECTS    **PROJECT:** RAYTOWN CMS RENOVATION

1828 WALNUT STREET, SUITE 922

10601 E 59TH STREET

KANSAS CITY, MISSOURI 64108

RAYTOWN , MISSOURI 64133

**SPECIFIED ITEM:** \_\_\_\_\_

**PROPOSED SUBSTITUTE:** \_\_\_\_\_

**SUBMITTED BY:** \_\_\_\_\_

**FIRM:** \_\_\_\_\_

**ADDRESS:** \_\_\_\_\_

**SIGNATURE:** \_\_\_\_\_ **DATE:** \_\_\_\_\_

**PHONE NUMBER:** \_\_\_\_\_

ATTACH COMPLETE DESCRIPTION, DESIGNATION, CATALOG OR MODEL NUMBER, SPEC DATA SHEET AND OTHER TECHNICAL DATA AND SAMPLES, INCLUDING LABORATORY TESTS IF APPLICABLE.

*FILL IN BLANKS BELOW:*

1. WILL SUBSTITUTION AFFECT DIMENSION INDICATED ON DRAWINGS?
  
2. WILL SUBSTITUTION AFFECT WIRING, PIPING, DUCTWORK, ETC., INDICATED ON DRAWINGS?
  
3. WHAT EFFECT WILL SUBSTITUTION HAVE ON OTHER TRADES?
  
4. DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED ITEM?

5. ANY AND ALL IMPACTS ON COSTS, DESIGN MODIFICATIONS, ADDITIONAL ARCHITECTURAL AND ENGINEERING SERVICES, MATERIAL AND LABOR CHANGES, SCHEDULE CHANGES, AND OTHER UNANTICIPATED CONSEQUENCES, RESULTING FROM THIS SUBSTITUTION IN LIEU OF THE SPECIFIED ITEM, SHALL BE THE FULL RESPONSIBILITY OF THE CONTRACTOR AND HIS SUBCONTRACTORS AND SUPPLIER.

6. MANUFACTURER'S WARRANTIES OF THE SPECIFIED ITEMS AND PROPOSED ITEMS ARE:  SAME OR  DIFFERENT, *EXPLAIN:* \_\_\_\_\_

**REVIEW COMMENTS:**

**NO EXCEPTION TAKEN TO SUBMITTED MANUFACTURER**

*MANUFACTURER ONLY IS ACCEPTED DUE TO TIME LIMITATIONS FOR FULL REVIEW OF PRODUCT, OR BECAUSE NO SPECIFIC PRODUCT DATA IS SUBMITTED, OR OTHER UNSPECIFIED REASONS. CONTRACTOR MUST STILL BEAR FULL RESPONSIBILITY FOR COMPLIANCE WITH CONTRACT REQUIREMENTS.*

**NO EXCEPTION TAKEN TO SPECIFIC PRODUCTS**

**EXCEPTIONS NOTED**

*SEE ATTACHED COPY OR NOTES ON PRODUCT LITERATURE*

**NOT ACCEPTED**

**RECEIVED TOO LATE**

BY: \_\_\_\_\_ DATE: \_\_\_\_\_

REMARKS: \_\_\_\_\_

END OF SECTION 012500.01

## **SECTION 012600 - CONTRACT MODIFICATION PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
  - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

#### **1.2 MINOR CHANGES IN THE WORK**

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

#### **1.3 PROPOSAL REQUESTS**

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    - e. Quotation Form: Use form acceptable to Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
  - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  - 4. Include costs of labor and supervision directly attributable to the change.

5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

#### 1.4 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
- B. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

#### 1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.
  1. Change Orders are to be dated and numbered sequentially.
- B. Change Orders will describe the change or changes, will refer to the related Proposal Request number and date; and will be signed by the Owner and Architect.

#### 1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 012600

## **SECTION 012900 - PAYMENT PROCEDURES**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
  - 1. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
  - 2. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 3. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

#### **1.2 DEFINITIONS**

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

#### **1.3 SCHEDULE OF VALUES**

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
  - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with continuation sheets.
    - b. Submittal schedule.
    - c. Items required to be indicated as separate activities in Contractor's construction schedule.
  - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.
  - 3. Sub-schedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values coordinated with each phase of payment.
  - 4. Sub-schedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide sub-schedules showing values coordinated with each element.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the schedule of values:
    - a. Project name and location.
    - b. Name of Architect.
    - c. Architect's project number.
    - d. Contractor's name and address.
    - e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
  - a. Related Specification Section or Division.
  - b. Description of the Work.
  - c. Name of subcontractor.
  - d. Name of manufacturer or fabricator.
  - e. Name of supplier.
  - f. Change Orders (numbers) that affect value.
  - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
    - 1) Labor.
    - 2) Materials.
    - 3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five (5) percent of the Contract Sum.
  - a. Include separate line items under Contractor and principal subcontracts Project closeout requirements in an amount totaling five (5) percent of the Contract Sum and subcontract amount.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
  - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
10. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

#### 1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
  1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.



- B. Payment Application Times: Submit Application for Payment to Architect by the 30th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment. Sample copies are included in Project Manual.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
  - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
  - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
  - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
  - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
  - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  - 3. Provide summary documentation for stored materials indicating the following:
    - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit three (3) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
  - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from each, subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
  - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.

2. When an application shows completion of an item, submit conditional final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  5. Waiver Forms: Submit executed waivers of lien on forms, included in the Project Manual.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
  2. Schedule of values.
  3. Contractor's construction schedule (preliminary if not final).
  4. Products list (preliminary if not final).
  5. Schedule of unit prices.
  6. Submittal schedule (preliminary if not final).
  7. List of Contractor's staff assignments.
  8. List of Contractor's principal consultants.
  9. Copies of building permits.
  10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  11. Initial progress report.
  12. Report of pre-construction conference.
  13. Certified payroll reports.
- I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
  2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.

3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that all claims have been settled.
8. Final liquidated damages settlement statement, if applicable.
9. Copy of the Affidavit of Compliance with Prevailing Wage Determination sent to the State.
10. Asbestos-Free and Lead-Free Certification Letter in form acceptable to Owner.
11. Evidence that claims have been settled.
12. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
13. Other close-out documentation required by the Contract Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 012900



## **SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General coordination procedures.
  - 2. Coordination drawings.
  - 3. Requests for Information (RFIs).
  - 4. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
  - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
  - 2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

#### **1.2 DEFINITIONS**

- A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

#### **1.3 INFORMATIONAL SUBMITTALS**

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use form acceptable to Architect. Include the following information in tabular form:
  - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within ten (10) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project. Keep list current at all times.

1. Post paper copies of list in project meeting room, in temporary field office, and by each temporary telephone.

#### 1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that depend on each other for proper installation, connection, and operation.
  1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
  3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  1. Preparation of Contractor's construction schedule.
  2. Preparation of the schedule of values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Preinstallation conferences.
  7. Project closeout activities.
  8. Startup and adjustment of systems.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
  1. Refer to Section 017419 "Construction Waste Management and Disposal" for additional requirements.

#### 1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability

necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
  - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
  - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
  - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
  - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
  - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
  - f. Indicate required installation sequences.
  - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
  1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
  2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
  4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
  5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
  6. Mechanical and Plumbing Work: Show the following:
    - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    - c. Fire-rated enclosures around ductwork.
  7. Electrical Work: Show the following:
    - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.

- c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
  - 8. Fire-Protection System: Show the following:
    - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
  - 9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
  - 10. Coordination Drawing Prints: As deemed necessary by Construction Manager, prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
  - 1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
  - 2. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
  - 3. BIM File Incorporation: Develop and incorporate coordination drawing files into Building Information Model established for Project.
    - a. Refer to individual Scopes of Work for Trades required to perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
  - 4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
    - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
    - b. Digital Drawing Software Program: The Contract Drawings are available in Revit version 2021 using Windows 10 operating system.
    - c. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual.

#### 1.6 REQUESTS FOR INFORMATION (RFIS)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
  - 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
  - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
  - 1. Project name.
  - 2. Project number.
  - 3. Date.



4. Name of Contractor.
  5. Name of Architect.
  6. RFI number, numbered sequentially.
  7. RFI subject.
  8. Specification Section number and title and related paragraphs, as appropriate.
  9. Drawing number and detail references, as appropriate.
  10. Field dimensions and conditions, as appropriate.
  11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  12. Contractor's signature.
  13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716 or a software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. Incomplete RFIs or inaccurately prepared RFIs.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
  3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly in form acceptable to Architect. Include the following:
1. Project name.

2. Name and address of Contractor.
  3. Name and address of Architect.
  4. RFI number including RFIs that were returned without action or withdrawn.
  5. RFI description.
  6. Date the RFI was submitted to the Architect.
  7. Date Architect's response was received.
- F. On receipt of Architect's action, immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if Contractor disagrees with response.
1. Change in Work shall be recorded to the Project Record set per Section 017839 "Project Record Documents".

## 1.7 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three (3) days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
  2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; each Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Lines of communications.
    - f. Procedures for processing field decisions and Change Orders.
    - g. Procedures for RFIs.
    - h. Procedures for testing and inspecting.
    - i. Procedures for processing Applications for Payment.
    - j. Distribution of the Contract Documents.
    - k. Submittal procedures.
    - l. Preparation of record documents.
    - m. Use of the premises.

- n. Work restrictions.
  - o. Working hours.
  - p. Owner's occupancy requirements.
  - q. Responsibility for temporary facilities and controls.
  - r. Procedures for moisture and mold control.
  - s. Procedures for disruptions and shutdowns.
  - t. Construction waste management and recycling.
  - u. Parking availability.
  - v. Office, work, and storage areas.
  - w. Equipment deliveries and priorities.
  - x. First aid.
  - y. Security.
  - z. Progress cleaning.
4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Owner's Commissioning Authority of scheduled meeting dates.
  2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility requirements.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written instructions.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Installation procedures.
    - v. Coordination with other work.
    - w. Required performance results.
    - x. Protection of adjacent work.
    - y. Protection of construction and personnel.
  3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 60 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
  2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of record documents.
    - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    - c. Submittal of written warranties.
    - d. Requirements for preparing operations and maintenance data.
    - e. Requirements for delivery of material samples, attic stock, and spare parts.
    - f. Requirements for demonstration and training.
    - g. Preparation of Contractor's punch list.
    - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    - i. Submittal procedures.
    - j. Owner's partial occupancy requirements.
    - k. Installation of Owner's furniture, fixtures, and equipment.
    - l. Responsibility for removing temporary facilities and controls.
  4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at weekly or biweekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
  2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Resolution of BIM component conflicts.

- 4) Status of submittals.
  - 5) Deliveries.
  - 6) Off-site fabrication.
  - 7) Access.
  - 8) Site utilization.
  - 9) Temporary facilities and controls.
  - 10) Progress cleaning.
  - 11) Quality and work standards.
  - 12) Status of correction of deficient items.
  - 13) Field observations.
  - 14) Status of RFIs.
  - 15) Status of proposal requests.
  - 16) Pending changes.
  - 17) Status of Change Orders.
  - 18) Pending claims and disputes.
  - 19) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work. Owner's Commissioning Authority and Architect will attend as deemed necessary.
  2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    - c. Review present and future needs of each contractor present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Resolution of BIM component conflicts.
      - 4) Status of submittals.
      - 5) Deliveries.
      - 6) Off-site fabrication.
      - 7) Access.
      - 8) Site utilization.
      - 9) Temporary facilities and controls.
      - 10) Work hours.
      - 11) Hazards and risks.
      - 12) Progress cleaning.

- 13) Quality and work standards.
  - 14) Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 013100

## **SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Startup construction schedule.
  - 2. Contractor's construction schedule.
  - 3. Construction schedule updating reports.
  - 4. Daily construction reports.
  - 5. Material location reports.
  - 6. Site condition reports.
  - 7. Special reports.
- B. Related Requirements:
  - 1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
  - 2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

#### **1.2 DEFINITIONS**

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
  - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
  - 2. Predecessor Activity: An activity that precedes another activity in the network.
  - 3. Successor Activity: An activity that follows another activity in the network.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Event: The starting or ending point of an activity.
- E. Float: The measure of leeway in starting and completing an activity.
  - 1. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

2. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

### 1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file

B. Startup construction schedule.

1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Daily Construction Reports: Submit at monthly intervals.

F. Material Location Reports: Submit at monthly intervals.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

H. Special Reports: Submit at time of unusual event.

1. Adverse Weather Days: Document conditions effecting construction activities and submit within 24 hours of the event.

### 1.4 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations and interim milestones.
4. Review delivery dates for Owner-furnished products.
5. Review submittal requirements and procedures.
6. Review time required for review of submittals and resubmittals.



7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
9. Review and finalize list of construction activities to be included in schedule.
10. Review procedures for updating schedule.

## 1.5 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
  1. Secure time commitments for performing critical elements of the Work from entities involved.
  2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

## PART 2 PRODUCTS

### 2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
  1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work.  
Comply with the following:
  1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
  2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
  3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
  4. Startup and Testing Time: Include no fewer than 20 days for startup and testing.
  5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
  6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
  2. Work under More Than One Contract: Include a separate activity for each contract.
  3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner, if any.
  4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
  5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
  6. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Uninterruptible services.
    - c. Use of premises restrictions.
    - d. Provisions for future construction.
    - e. Seasonal variations.
    - f. Environmental control.
  7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    - a. Subcontract awards.
    - b. Submittals.
    - c. Purchases.
    - d. Mockups.
    - e. Fabrication.
    - f. Sample testing.
    - g. Deliveries.
    - h. Installation.
    - i. Tests and inspections.
    - j. Adjusting.
    - k. Curing.
    - l. Building flush-out.
    - m. Startup and placement into final use and operation.
  8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
    - a. Structural completion.
    - b. Temporary enclosure and space conditioning.
    - c. Permanent space enclosure.
    - d. Completion of mechanical installation.
    - e. Completion of electrical installation.
    - f. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of

payment requests.

1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
  2. Unanswered Requests for Information.
  3. Rejected or unreturned submittals.
  4. Notations on returned submittals.
  5. Pending modifications affecting the Work and Contract Time.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

## 2.2 STARTUP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven (7) days of date established for the Notice to Proceed or Notice of Award, whichever is earlier.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

## 2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
    - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
  3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
  4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Refer to Section 007300 for additional requirements.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities.
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
  2. Changes in early and late start dates.
  3. Changes in early and late finish dates.
  4. Changes in activity durations in workdays.
  5. Changes in the critical path.
  6. Changes in total float or slack time.
  7. Changes in the Contract Time.

## 2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
  2. List of separate contractors at Project site.
  3. Approximate count of personnel at Project site.
  4. Equipment at Project site.
  5. Material deliveries.
  6. High and low temperatures and general weather conditions, including presence of rain or snow.
  7. Accidents.

8. Meetings and significant decisions.
  9. Unusual events (see special reports).
  10. Stoppages, delays, shortages, and losses.
  11. Meter readings and similar recordings.
  12. Emergency procedures.
  13. Orders and requests of authorities having jurisdiction.
  14. Change Orders received and implemented.
  15. Construction Change Directives received and implemented.
  16. Services connected and disconnected.
  17. Equipment or system tests and startups.
  18. Partial completions and occupancies.
  19. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
  2. Material stored prior to previous report and since removed from storage and installed.
  3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

## 2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner and Architect within two day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

## PART 3 EXECUTION

### 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
  - 1. Post copies in Project meeting rooms and temporary field offices.
  - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

## **SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for the following:
  - 1. Preconstruction photographs.
  - 2. Periodic construction photographs.
  - 3. Final completion construction photographs.
- B. Related Requirements:
  - 1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
  - 2. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### **1.2 INFORMATIONAL SUBMITTALS**

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
  - 1. Submit photos by uploading to web-based project software site or via email. Include copy of key plan indicating each photograph's location and direction.
  - 2. Identification: Provide the following information with each image description:
    - a. Name of Project.
    - b. Name and contact information for photographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date photograph was taken.
    - f. Description of location, vantage point, and direction.
    - g. Unique sequential identifier keyed to accompanying key plan.

#### **1.3 FORMATS AND MEDIA**

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.
- B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- C. Metadata: Record accurate date and time from camera.
- D. File Names: Name media files with date, Project area, and sequential numbering suffix.

#### 1.4 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs with maximum depth of field and in focus.
  - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
  - 1. Flag construction limits before taking construction photographs.
  - 2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
  - 3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
  - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- C. Periodic Construction Photographs: Take 20 photographs biweekly. Select vantage points to show status of construction and progress since last photographs were taken.
- D. Final Completion Construction Photographs: Take 20 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 013233



## **SECTION 013300 - SUBMITTAL PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
  - 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
  - 2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
  - 3. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and Record Product Data.
  - 5. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### **1.2 DEFINITIONS**

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

#### **1.3 ACTION SUBMITTALS**

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
  - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
  - a. Scheduled date for first submittal.
  - b. Specification Section number and title.
  - c. Submittal category: Action; informational.
  - d. Name of subcontractor.
  - e. Description of the Work covered.
  - f. Scheduled date for Architect's final release or approval.
  - g. Scheduled date of fabrication.
  - h. Scheduled dates for installation.
  - i. Scheduled dates for purchasing.

#### 1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect to Contractor, at a nominal cost, for use in preparing submittals.
  1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
    - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    - b. Digital Drawing Software Program: The Contract Drawings are available in Revit version 2019 using Windows 10 operating system.
    - c. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of

failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. It is expected that all submittals will be submitted within the durations outlined in the bid form as provided by each trade.
    - a. A \$100.00 per calendar day penalty will be assessed for any submittal received after durations received as provided by each trade. The penalty will be deducted from the contract through deductive change order. Only if written authorization from the Architect to extend this time frame can this “per day” penalty not be enforced.
    - b. The completion time of the contract will not be extended for delays caused by tardiness of submittals. Cost of such delays shall not be borne by the Owner and may be back-charged as necessary.
      - 1) Contractor shall assume full responsibility for providing materials as specified at their risk to maintain schedule if submittals are not submitted within durations provided on the bid form.
    - c. Upon receipt of unapproved submittals, Contractors will have seven (7) calendar days to revise and resubmit. After such time, the penalty outlined above in 1.4 C.1.a will be assessed.
  2. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  3. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  4. Resubmittal Review: Allow 7 days for review of each resubmittal.
  5. Sequential Review: Where sequential review of submittals by Architect’s consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
  6. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect’s consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect, before being returned to Contractor.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier.
    - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., RBU-079200.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., RBU-079200.01.A).
    - b. Specific material/product identifier: After listing the project identifier and section number as described above, clearly indicate the material/product submitted corresponding to specific paragraph in the specification (e.g., Silicone Joint Sealant – 2.2 A).
  3. Provide means for insertion to permanently record Contractor’s review and approval markings and action taken by Architect.
  4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software or electronic form acceptable to Owner, containing the following information:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name of Contractor.
    - e. Name of firm or entity that prepared submittal.
    - f. Names of subcontractor, manufacturer, and supplier.
    - g. Category and type of submittal.

- h. Submittal purpose and description.
  - i. Specification Section number and title.
  - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
  - k. Drawing number and detail references, as appropriate.
  - l. Location(s) where product is to be installed, as appropriate.
  - m. Related physical samples submitted directly.
  - n. Indication of full or partial submittal.
  - o. Transmittal number, numbered consecutively.
  - p. Submittal and transmittal distribution record.
  - q. Other necessary identification.
  - r. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
- a. Project name.
  - b. Number and title of appropriate Specification Section.
  - c. Manufacturer name.
  - d. Product name.
- E. Options: Clearly identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- 1. Note date and content of previous submittal.
  - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  - 3. Resubmit submittals until they are marked with approval notation from Architect's and Construction Manager's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

## PART 2 PRODUCTS

### 2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
- 1. Submit electronic submittals via email as PDF electronic files.
    - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
    - b. Along with the electronic submittal, Contractor shall submit to the Architect, one (1) full sized hard copy of each shop drawing for review and approval, as deemed necessary by the Architect.
    - c. Along with the electronic submittal, contractors shall submit to the Architect, one (1) color deck or color card for each submittal requiring color selection for review, approval and color selection, as deemed necessary by the Architect.

2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
  3. Submittals shall constitute an implied statement by the General Contractor and Subcontractor that the submitted items comply with the following statements:
    - a. Items have been reviewed and accepted by the General Contractor and Subcontractor.
    - b. Items have been verified and coordinated with specifications, measurements, conditions, and relevant criteria of the Contract Documents.
    - c. Items can be fabricated and delivered to the project site within the proposed project schedule.
  4. Review of submittals by the Architect and/or Owner shall not relieve the Contractor from full compliance with the Construction Documents.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to clearly show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts/decks.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before or concurrent with Samples and Shop Drawings, as applicable.
  6. Submit Product Data in the following format:
    - a. PDF electronic file according to Paragraph 2.1 A.1.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.

- c. Compliance with specified standards.
  - d. Notation of coordination requirements.
  - e. Notation of dimensions established by field measurement.
  - f. Relationship and attachment to adjoining construction clearly indicated.
  - g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
  3. Submit Shop Drawings in the following format:
    - a. PDF electronic file according to Paragraph 2.1 A.1.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of applicable Specification Section.
    - e. Specification paragraph number and generic name of each item.
  3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
  4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Sample for "initial selection" shall be listed as a separate item in the submittal schedule.
    - b. Number of Samples: Unless specifically required otherwise in Specification Section, submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
  6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

- 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
  - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
7. Electronic Transmittal: Provide PDF transmittal for all physical Samples. Include digital image file illustrating Sample characteristics, and identification information for record.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
  5. Submit product schedule in the following format:
    - a. PDF electronic file.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

- O. **Manufacturer Certificates:** Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. **Product Certificates:** Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. **Material Certificates:** Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. **Material Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- S. **Product Test Reports:** Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- T. **Research Reports:** Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.
  - 7. Limitations of use.
- U. **Preconstruction Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- V. **Compatibility Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- W. **Field Test Reports:** Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- X. **Design Data:** Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and



version of software, if any, used for calculations. Include page numbers.

## 2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file in addition to three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C. BIM File Incorporation: Incorporate delegated-design drawing and data files into Building Information Model established for Project.
  - 1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.

## PART 3 EXECUTION

### 3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear the Contractor's approval stamp and will return them without action.

B. Action Submittals: Contractor is responsible for conforming and correlating dimensions at job sites for tolerances, clearances, quantities, fabrication processes, coordination of the Work with multiple trades, and full compliance with the Contract Documents. The Architect will review submittals for general conformance with the Contract Documents. Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action as follows:

1. No Exception Taken: Signifies item represented in the submittal conforms to the design intent, complies with the intent of the Contract Documents and is acceptable for incorporation into the Work. Contractor is to proceed with fabrication or procurement and related work.
2. Exceptions Noted: Signifies item represented in the submittal conforms to the design concept, complies with the intent of the Contract Documents and is recommended for incorporation into the Work in accordance with the Architect's and/or Consultant's notations. Contractor is to proceed with the work in accordance the Architect's and/or Consultant's notations marked on the returned submittal or letter of transmittal. Resubmittal is not required.
3. Revised and Resubmit: Signifies item represented in the submittal appears to conform to the design concept and comply with the intent of the Contract Documents, but information is either insufficient or contains discrepancies which prevent the Architect and/or his Consultant from completing his review. Contractor is to resubmit revised information. Fabrication or procurement of the item and related work is not to proceed until the submittal is acceptable.
4. Not Accepted: Signifies item represented in the submittal does not conform to the design concept or comply with the intent of the Contract Documents and is not recommended for incorporation into the Work. Contractor shall submit items responsive to the Contract Documents.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

F. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

## **SECTION 014000 - QUALITY REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority or authorities having jurisdiction are not limited by provisions of this Section.
  - 4. Specific test and inspection requirements are not specified in this Section.

#### **1.2 DEFINITIONS**

- A. **Quality-Assurance Services:** Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. **Quality-Control Services:** Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. **Mockups/Field Samples:** Full-size physical assemblies that are constructed on-site. Mockups/field samples are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances.  
  
Mockups/Field Samples are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
  - 1. **Laboratory Mockups:** Full-size physical assemblies constructed and tested at testing facility to verify performance characteristics.
  - 2. **Integrated Exterior Mockups:** Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

3. Integrated Field Samples: Field samples of select portions exterior envelope or interior construction erected as part of the Work. Field samples may consist of multiple products, assemblies, and subassemblies.
  4. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
  - E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
  - F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
  - G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
  - H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
  - I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
    1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
  - J. Experienced: When used with an entity or individual, "experienced" means, unless otherwise specified in the individual specification section, having successfully completed a minimum of five (5) previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

### 1.3 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

#### 1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.
  - 1. Whenever Contract Documents reasonably infer materials or installation as necessary to produce the intended results, but do not fully detail or specify such materials, the Contractor shall provide the more expensive method or material, or greater quantity, unless he has obtained a written decision from the Architect.

#### 1.5 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups/field samples, provide plans, sections, and elevations, indicating materials and size of mockup construction.
  - 1. Indicate manufacturer and model number of individual components.
  - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
  - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
  - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

- C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Entity responsible for performing tests and inspections.
  - 3. Description of test and inspection.
  - 4. Identification of applicable standards.
  - 5. Identification of test and inspection methods.
  - 6. Number of tests and inspections required.
  - 7. Time schedule or time span for tests and inspections.
  - 8. Requirements for obtaining samples.
  - 9. Unique characteristics of each quality-control service.

#### 1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
  - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
  - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
  - 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
  - 3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.

- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

## 1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
  - 1. Name, address, and telephone number of technical representative making report.
  - 2. Statement on condition of substrates and their acceptability for installation of product.
  - 3. Statement that products at Project site comply with requirements.
  - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
  2. Statement that equipment complies with requirements.
  3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  4. Statement whether conditions, products, and installation will affect warranty.
  5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

#### 1.9 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
  1. Refer to individual specification sections for additional requirements.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.



- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
  2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    - f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.
  2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
  3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
  4. Demonstrate the proposed range of aesthetic effects and workmanship.
  5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.
  6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  7. Unless otherwise indicated in the Contract Documents, demolish and remove mockups when directed unless otherwise indicated.
- L. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.
- M. Field Samples: Construct/apply field samples using required materials, products, finishes and assemblies, finished according to requirements for the completed work. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work:
1. Build field sample of size indicated or, if not indicated, as directed by Architect.
  2. Notify Architect three (3) days in advance of dates and times when field samples will be constructed/applied.
  3. Notify Architect seven (7) days in advance of dates and times when field sample will be constructed/applied.
  4. Demonstrate the proposed aesthetic effects and workmanship to be incorporated into the Work.
  5. Obtain Architect's approval of field sample before starting remainder of work.
    - a. Allow three (3) days for initial review and each re-review of each field sample.
  6. Field samples not acceptable to Architect shall be re-constructed/re-applied until field sample is accepted to Architect.
  7. Maintain field sample during construction in an undisturbed condition as a standard for judging the completed Work
  8. Unless otherwise indicated in the Contract Documents, dispose of field sample when directed by Architect and Owner.

## 1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
  2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify Architect, Commissioning Authority, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  - 6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
  - 1. Access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  - 4. Facilities for storage and field curing of test samples.
  - 5. Delivery of samples to testing agencies.
  - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect, Commissioning Authority, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### 1.11 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
  2. Notifying Architect, Commissioning Authority, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority, with copy to Contractor and to authorities having jurisdiction.
  4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
  6. Retesting and reinspecting corrected work.

#### PART 2 PRODUCTS (NOT USED)

#### PART 3 EXECUTION

##### 3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. Date test or inspection results were transmitted to Architect.
  4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, and Commissioning Authority's reference during normal working hours.

##### 3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining

areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

## **SECTION 014200 - REFERENCES**

### **PART 1 GENERAL**

#### **1.1 DEFINITIONS**

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

#### **1.2 INDUSTRY STANDARDS**

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

### 1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; [www.aabc.com](http://www.aabc.com)
2. AAMA - American Architectural Manufacturers Association; [www.aamanet.org](http://www.aamanet.org).
3. AAPFCO - Association of American Plant Food Control Officials; [www.aapfco.org](http://www.aapfco.org).
4. AASHTO - American Association of State Highway and Transportation Officials; [www.transportation.org](http://www.transportation.org).
5. AATCC - American Association of Textile Chemists and Colorists; [www.aatcc.org](http://www.aatcc.org).
6. ABMA - American Bearing Manufacturers Association; [www.americanbearings.org](http://www.americanbearings.org).
7. ABMA - American Boiler Manufacturers Association; [www.abma.com](http://www.abma.com).
8. ACI - American Concrete Institute; (Formerly: ACI International); [www.abma.com](http://www.abma.com).
9. ACPA - American Concrete Pipe Association; [www.concrete-pipe.org](http://www.concrete-pipe.org).
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); [www.aeic.org](http://www.aeic.org).
11. AF&PA - American Forest & Paper Association; [www.afandpa.org](http://www.afandpa.org).
12. AGA - American Gas Association; [www.aga.org](http://www.aga.org).
13. AHAM - Association of Home Appliance Manufacturers; [www.aham.org](http://www.aham.org).
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); [www.ahrinet.org](http://www.ahrinet.org).
15. AI - Asphalt Institute; [www.asphaltinstitute.org](http://www.asphaltinstitute.org).
16. AIA - American Institute of Architects (The); [www.aia.org](http://www.aia.org).
17. AISC - American Institute of Steel Construction; [www.aisc.org](http://www.aisc.org).
18. AISI - American Iron and Steel Institute; [www.steel.org](http://www.steel.org).
19. AITC - American Institute of Timber Construction; [www.aitc-glulam.org](http://www.aitc-glulam.org).
20. AMCA - Air Movement and Control Association International, Inc.; [www.amca.org](http://www.amca.org).
21. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).
22. AOSA - Association of Official Seed Analysts, Inc.; [www.aosaseed.com](http://www.aosaseed.com).
23. APA - APA - The Engineered Wood Association; [www.apawood.org](http://www.apawood.org).
24. APA - Architectural Precast Association; [www.archprecast.org](http://www.archprecast.org).
25. API - American Petroleum Institute; [www.api.org](http://www.api.org).
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; [www.asphaltroofing.org](http://www.asphaltroofing.org).
29. ASCE - American Society of Civil Engineers; [www.asce.org](http://www.asce.org).



30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; [www.ashrae.org](http://www.ashrae.org).
32. ASME - ASME International; (American Society of Mechanical Engineers); [www.asme.org](http://www.asme.org).
33. ASSE - American Society of Safety Engineers (The); [www.asse.org](http://www.asse.org).
34. ASSE - American Society of Sanitary Engineering; [www.asse-plumbing.org](http://www.asse-plumbing.org).
35. ASTM - ASTM International; [www.astm.org](http://www.astm.org).
36. ATIS - Alliance for Telecommunications Industry Solutions; [www.atis.org](http://www.atis.org).
37. AWEA - American Wind Energy Association; [www.awea.org](http://www.awea.org).
38. AWI - Architectural Woodwork Institute; [www.awinet.org](http://www.awinet.org).
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; [www.awmac.com](http://www.awmac.com).
40. AWPA - American Wood Protection Association; [www.awpa.com](http://www.awpa.com).
41. AWS - American Welding Society; [www.aws.org](http://www.aws.org).
42. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
43. BHMA - Builders Hardware Manufacturers Association; [www.buildershardware.com](http://www.buildershardware.com).
44. BIA - Brick Industry Association (The); [www.gobrick.com](http://www.gobrick.com).
45. BICSI - BICSI, Inc.; [www.bicsi.org](http://www.bicsi.org).
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); [www.bifma.org](http://www.bifma.org).
47. BISSC - Baking Industry Sanitation Standards Committee; [www.bissc.org](http://www.bissc.org).
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); [www.bissc.org](http://www.bissc.org).
49. CDA - Copper Development Association; [www.copper.org](http://www.copper.org).
50. CEA - Canadian Electricity Association; [www.electricity.ca](http://www.electricity.ca).
51. CEA - Consumer Electronics Association; [www.ce.org](http://www.ce.org).
52. CFFA - Chemical Fabrics and Film Association, Inc.; [www.chemicalfabricsandfilm.com](http://www.chemicalfabricsandfilm.com).
53. CFSEI - Cold-Formed Steel Engineers Institute; [www.cfsei.org](http://www.cfsei.org).
54. CGA - Compressed Gas Association; [www.cganet.com](http://www.cganet.com).
55. CIMA - Cellulose Insulation Manufacturers Association; [www.cellulose.org](http://www.cellulose.org).
56. CISCA - Ceilings & Interior Systems Construction Association; [www.cisca.org](http://www.cisca.org).
57. CISPI - Cast Iron Soil Pipe Institute; [www.cispi.org](http://www.cispi.org).
58. CLFMI - Chain Link Fence Manufacturers Institute; [www.chainlinkinfo.org](http://www.chainlinkinfo.org).
59. CPA - Composite Panel Association; [www.pbmdf.com](http://www.pbmdf.com).
60. CRI - Carpet and Rug Institute (The); [www.carpet-rug.org](http://www.carpet-rug.org).
61. CRRC - Cool Roof Rating Council; [www.coolroofs.org](http://www.coolroofs.org).

62. CRSI - Concrete Reinforcing Steel Institute; [www.crsi.org](http://www.crsi.org).
63. CSA - Canadian Standards Association; [www.csa.ca](http://www.csa.ca).
64. CSA - CSA International; (Formerly: IAS - International Approval Services); [www.csa-international.org](http://www.csa-international.org).
65. CSI - Construction Specifications Institute (The); [www.csinet.org](http://www.csinet.org).
66. CSSB - Cedar Shake & Shingle Bureau; [www.cedarbureau.org](http://www.cedarbureau.org).
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); [www.cti.org](http://www.cti.org).
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; [www.dasma.com](http://www.dasma.com).
70. DHI - Door and Hardware Institute; [www.dhi.org](http://www.dhi.org).
71. ECA - Electronic Components Association; (See ECIA).
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
73. ECIA - Electronic Components Industry Association; [www.eciaonline.org](http://www.eciaonline.org).
74. EIA - Electronic Industries Alliance; (See TIA).
75. EIMA - EIFS Industry Members Association; [www.eima.com](http://www.eima.com).
76. EJMA - Expansion Joint Manufacturers Association, Inc.; [www.ejma.org](http://www.ejma.org).
77. ESD - ESD Association; (Electrostatic Discharge Association); [www.esda.org](http://www.esda.org).
78. ESTA - Entertainment Services and Technology Association; (See PLASA).
79. EVO - Efficiency Valuation Organization; [www.evo-world.org](http://www.evo-world.org).
80. FCI - Fluid Controls Institute; [www.fluidcontrolsinstitute.org](http://www.fluidcontrolsinstitute.org).
81. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); [www.fiba.com](http://www.fiba.com).
82. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); [www.fivb.org](http://www.fivb.org).
83. FM Approvals - FM Approvals LLC; [www.fmglobal.com](http://www.fmglobal.com).
84. FM Global - FM Global; (Formerly: FMG - FM Global); [www.fmglobal.com](http://www.fmglobal.com).
85. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; [www.floridarroof.com](http://www.floridarroof.com).
86. FSA - Fluid Sealing Association; [www.fluidsealing.com](http://www.fluidsealing.com).
87. FSC - Forest Stewardship Council U.S.; [www.fscus.org](http://www.fscus.org).
88. GA - Gypsum Association; [www.gypsum.org](http://www.gypsum.org).
89. GANA - Glass Association of North America; [www.glasswebsite.com](http://www.glasswebsite.com).
90. GS - Green Seal; [www.greenseal.org](http://www.greenseal.org).
91. HI - Hydraulic Institute; [www.pumps.org](http://www.pumps.org).
92. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
93. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
94. HPVA - Hardwood Plywood & Veneer Association; [www.hpva.org](http://www.hpva.org).

95. HPW - H. P. White Laboratory, Inc.; [www.hpwhite.com](http://www.hpwhite.com).
96. IAPSC - International Association of Professional Security Consultants; [www.iapsc.org](http://www.iapsc.org).
97. IAS - International Accreditation Service; [www.iasonline.org](http://www.iasonline.org).
98. IAS - International Approval Services; (See CSA).
99. ICBO - International Conference of Building Officials; (See ICC).
100. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
101. ICEA - Insulated Cable Engineers Association, Inc.; [www.icea.net](http://www.icea.net).
102. ICPA - International Cast Polymer Alliance; [www.icpa-hq.org](http://www.icpa-hq.org).
103. ICRI - International Concrete Repair Institute, Inc.; [www.icri.org](http://www.icri.org).
104. IEC - International Electrotechnical Commission; [www.iec.ch](http://www.iec.ch).
105. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); [www.ieee.org](http://www.ieee.org).
106. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); [www.ies.org](http://www.ies.org).
107. IESNA - Illuminating Engineering Society of North America; (See IES).
108. IEST - Institute of Environmental Sciences and Technology; [www.iest.org](http://www.iest.org).
109. IGMA - Insulating Glass Manufacturers Alliance; [www.igmaonline.org](http://www.igmaonline.org).
110. IGSHPA - International Ground Source Heat Pump Association; [www.igshpa.okstate.edu](http://www.igshpa.okstate.edu).
111. ILI - Indiana Limestone Institute of America, Inc.; [www.iliai.com](http://www.iliai.com).
112. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); [www.intertek.com](http://www.intertek.com).
113. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); [www.isa.org](http://www.isa.org).
114. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
115. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); [www.isfanow.org](http://www.isfanow.org).
116. ISO - International Organization for Standardization; [www.iso.org](http://www.iso.org).
117. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
118. ITU - International Telecommunication Union; [www.itu.int/home](http://www.itu.int/home).
119. KCMA - Kitchen Cabinet Manufacturers Association; [www.kcma.org](http://www.kcma.org).
120. LMA - Laminating Materials Association; (See CPA).
121. LPI - Lightning Protection Institute; [www.lightning.org](http://www.lightning.org).
122. MBMA - Metal Building Manufacturers Association; [www.mbma.com](http://www.mbma.com).
123. MCA - Metal Construction Association; [www.metalconstruction.org](http://www.metalconstruction.org).
124. MFMA - Maple Flooring Manufacturers Association, Inc.; [www.maplefloor.org](http://www.maplefloor.org).

125. MFMA - Metal Framing Manufacturers Association, Inc.; [www.metalframingmfg.org](http://www.metalframingmfg.org).
126. MHIA - Material Handling Industry of America; [www.mhia.org](http://www.mhia.org).
127. MIA - Marble Institute of America; [www.marble-institute.com](http://www.marble-institute.com).
128. MMPA - Moulding & Millwork Producers Association; [www.wmmpa.com](http://www.wmmpa.com).
129. MPI - Master Painters Institute; [www.paintinfo.com](http://www.paintinfo.com).
130. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; [www.mss-hq.org](http://www.mss-hq.org).
131. NAAMM - National Association of Architectural Metal Manufacturers; [www.naamm.org](http://www.naamm.org).
132. NACE - NACE International; (National Association of Corrosion Engineers International); [www.nace.org](http://www.nace.org).
133. NADCA - National Air Duct Cleaners Association; [www.nadca.com](http://www.nadca.com).
134. NAIMA - North American Insulation Manufacturers Association; [www.naima.org](http://www.naima.org).
135. NBGQA - National Building Granite Quarries Association, Inc.; [www.nbgqa.com](http://www.nbgqa.com).
136. NBI - New Buildings Institute; [www.newbuildings.org](http://www.newbuildings.org).
137. NCAA - National Collegiate Athletic Association (The); [www.ncaa.org](http://www.ncaa.org).
138. NCMA - National Concrete Masonry Association; [www.ncma.org](http://www.ncma.org).
139. NEBB - National Environmental Balancing Bureau; [www.nebb.org](http://www.nebb.org).
140. NECA - National Electrical Contractors Association; [www.necanet.org](http://www.necanet.org).
141. NeLMA - Northeastern Lumber Manufacturers Association; [www.nelma.org](http://www.nelma.org).
142. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
143. NETA - InterNational Electrical Testing Association; [www.netaworld.org](http://www.netaworld.org).
144. NFHS - National Federation of State High School Associations; [www.nfhs.org](http://www.nfhs.org).
145. NFPA - National Fire Protection Association; [www.nfpa.org](http://www.nfpa.org).
146. NFPA - NFPA International; (See NFPA).
147. NFRC - National Fenestration Rating Council; [www.nfrc.org](http://www.nfrc.org).
148. NHLA - National Hardwood Lumber Association; [www.nhla.com](http://www.nhla.com).
149. NLGA - National Lumber Grades Authority; [www.nlga.org](http://www.nlga.org).
150. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
151. NOMMA - National Ornamental & Miscellaneous Metals Association; [www.nomma.org](http://www.nomma.org).
152. NRCA - National Roofing Contractors Association; [www.nrca.net](http://www.nrca.net).
153. NRMCA - National Ready Mixed Concrete Association; [www.nrmca.org](http://www.nrmca.org).
154. NSF - NSF International; [www.nsf.org](http://www.nsf.org).
155. NSPE - National Society of Professional Engineers; [www.nspe.org](http://www.nspe.org).
156. NSSGA - National Stone, Sand & Gravel Association; [www.nssga.org](http://www.nssga.org).
157. NTMA - National Terrazzo & Mosaic Association, Inc. (The); [www.ntma.com](http://www.ntma.com).

158. NWFA - National Wood Flooring Association; [www.nwfa.org](http://www.nwfa.org).
159. PCI - Precast/Prestressed Concrete Institute; [www.pci.org](http://www.pci.org).
160. PDI - Plumbing & Drainage Institute; [www.pdionline.org](http://www.pdionline.org).
161. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); [www.plasa.org](http://www.plasa.org).
162. RCSC - Research Council on Structural Connections; [www.boltcouncil.org](http://www.boltcouncil.org).
163. RFCI - Resilient Floor Covering Institute; [www.rfci.com](http://www.rfci.com).
164. RIS - Redwood Inspection Service; [www.redwoodinspection.com](http://www.redwoodinspection.com).
165. SAE - SAE International; [www.sae.org](http://www.sae.org).
166. SCTE - Society of Cable Telecommunications Engineers; [www.scte.org](http://www.scte.org).
167. SDI - Steel Deck Institute; [www.sdi.org](http://www.sdi.org).
168. SDI - Steel Door Institute; [www.steeldoor.org](http://www.steeldoor.org).
169. SEFA - Scientific Equipment and Furniture Association (The); [www.sefalabs.com](http://www.sefalabs.com).
170. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
171. SIA - Security Industry Association; [www.siaonline.org](http://www.siaonline.org).
172. SJI - Steel Joist Institute; [www.steeljoist.org](http://www.steeljoist.org).
173. SMA - Screen Manufacturers Association; [www.smainfo.org](http://www.smainfo.org).
174. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; [www.smacna.org](http://www.smacna.org).
175. SMPTE - Society of Motion Picture and Television Engineers; [www.smpte.org](http://www.smpte.org).
176. SPFA - Spray Polyurethane Foam Alliance; [www.sprayfoam.org](http://www.sprayfoam.org).
177. SPIB - Southern Pine Inspection Bureau; [www.spib.org](http://www.spib.org).
178. SPRI - Single Ply Roofing Industry; [www.spri.org](http://www.spri.org).
179. SRCC - Solar Rating & Certification Corporation; [www.solar-rating.org](http://www.solar-rating.org).
180. SSINA - Specialty Steel Industry of North America; [www.ssina.com](http://www.ssina.com).
181. SSPC - SSPC: The Society for Protective Coatings; [www.sspc.org](http://www.sspc.org).
182. STI - Steel Tank Institute; [www.steeltank.com](http://www.steeltank.com).
183. SWI - Steel Window Institute; [www.steelwindows.com](http://www.steelwindows.com).
184. SWPA - Submersible Wastewater Pump Association; [www.swpa.org](http://www.swpa.org).
185. TCA - Tilt-Up Concrete Association; [www.tilt-up.org](http://www.tilt-up.org).
186. TCNA - Tile Council of North America, Inc.; [www.tileusa.com](http://www.tileusa.com).
187. TEMA - Tubular Exchanger Manufacturers Association, Inc.; [www.tema.org](http://www.tema.org).
188. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); [www.tiaonline.org](http://www.tiaonline.org).
189. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).

190. TMS - The Masonry Society; [www.masonrysociety.org](http://www.masonrysociety.org).
191. TPI - Truss Plate Institute; [www.tpinst.org](http://www.tpinst.org).
192. TPI - Turfgrass Producers International; [www.turfgrassod.org](http://www.turfgrassod.org).
193. TRI - Tile Roofing Institute; [www.tilerroofing.org](http://www.tilerroofing.org).
194. UL - Underwriters Laboratories Inc.; [www.ul.com](http://www.ul.com).
195. UNI - Uni-Bell PVC Pipe Association; [www.uni-bell.org](http://www.uni-bell.org).
196. USAV - USA Volleyball; [www.usavolleyball.org](http://www.usavolleyball.org).
197. USGBC - U.S. Green Building Council; [www.usgbc.org](http://www.usgbc.org).
198. USITT - United States Institute for Theatre Technology, Inc.; [www.usitt.org](http://www.usitt.org).
199. WASTEC - Waste Equipment Technology Association; [www.wastec.org](http://www.wastec.org).
200. WCLIB - West Coast Lumber Inspection Bureau; [www.wclib.org](http://www.wclib.org).
201. WCMA - Window Covering Manufacturers Association; [www.wcmanet.org](http://www.wcmanet.org).
202. WDMA - Window & Door Manufacturers Association; [www.wdma.com](http://www.wdma.com).
203. WI - Woodwork Institute; [www.wicnet.org](http://www.wicnet.org).
204. WSRCA - Western States Roofing Contractors Association; [www.wsrca.com](http://www.wsrca.com).
205. WWPA - Western Wood Products Association; [www.wwpa.org](http://www.wwpa.org).

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut für Normung e.V.; [www.din.de](http://www.din.de).
2. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org](http://www.iapmo.org).
3. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
4. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; [www.usace.army.mil](http://www.usace.army.mil).
2. CPSC - Consumer Product Safety Commission; [www.cpsc.gov](http://www.cpsc.gov).
3. DOC - Department of Commerce; National Institute of Standards and Technology; [www.nist.gov](http://www.nist.gov).
4. DOD - Department of Defense; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
5. DOE - Department of Energy; [www.energy.gov](http://www.energy.gov).
6. EPA - Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
7. FAA - Federal Aviation Administration; [www.faa.gov](http://www.faa.gov).

8. FG - Federal Government Publications; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
  9. GSA - General Services Administration; [www.gsa.gov](http://www.gsa.gov).
  10. HUD - Department of Housing and Urban Development; [www.hud.gov](http://www.hud.gov).
  11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; [www.eetd.lbl.gov](http://www.eetd.lbl.gov).
  12. OSHA - Occupational Safety & Health Administration; [www.osha.gov](http://www.osha.gov).
  13. SD - Department of State; [www.state.gov](http://www.state.gov).
  14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; [www.trb.org](http://www.trb.org).
  15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; [www.ars.usda.gov](http://www.ars.usda.gov).
  16. USDA - Department of Agriculture; Rural Utilities Service; [www.usda.gov](http://www.usda.gov).
  17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; [www.ojp.usdoj.gov](http://www.ojp.usdoj.gov).
  18. USP - U.S. Pharmacopeial Convention; [www.usp.org](http://www.usp.org).
  19. USPS - United States Postal Service; [www.usps.com](http://www.usps.com).
- D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
  2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
  3. DSCC - Defense Supply Center Columbus; (See FS).
  4. FED-STD - Federal Standard; (See FS).
  5. FS - Federal Specification; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
    - a. Available from Defense Standardization Program; [www.dsp.dla.mil](http://www.dsp.dla.mil).
    - b. Available from General Services Administration; [www.gsa.gov](http://www.gsa.gov).
    - c. Available from National Institute of Building Sciences/Whole Building Design Guide; [www.wbdg.org/ccb](http://www.wbdg.org/ccb).
  6. MILSPEC - Military Specification and Standards; (See DOD).
  7. USAB - United States Access Board; [www.access-board.gov](http://www.access-board.gov).
  8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; [www.bearhfti.ca.gov](http://www.bearhfti.ca.gov).
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; [www.calregs.com](http://www.calregs.com).
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; [www.cal-iaq.org](http://www.cal-iaq.org).
5. CPUC; California Public Utilities Commission; [www.cpuc.ca.gov](http://www.cpuc.ca.gov).
6. SCAQMD; South Coast Air Quality Management District; [www.aqmd.gov](http://www.aqmd.gov).
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; [www.txforestsERVICE.tamu.edu](http://www.txforestsERVICE.tamu.edu).

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 014200



## **SECTION 014529 - TESTING AND INSPECTIONS**

### **PART 1 - GENERAL**

#### **1.1 GENERAL**

- A. The preceding "General Conditions" are a part of these specifications and the Contractor shall consult them in detail in connection with this part of the work.

#### **1.2 SCOPE OF WORK**

- A. Employment of a testing and inspection firm approved and paid for by the Owner. Approximate scope of testing and inspection shall be as indicated on the drawings and herein specified in the sections of the specifications.
  - 1. Refer to attachment for scope of testing to be provided by Owner.

#### **1.3 TESTING AND INSPECTION CHARGES**

- A. For the following conditions, costs of testing and inspection services shall be paid for by the Contractor, apart from the Testing and Inspection.
  - 1. Costs arising from errors or omissions by the Contractor.
  - 2. Costs of concrete cores, of re-testing materials that fail, and of required identification of materials (mill tests, manufacturers certifications, etc.).
  - 3. Costs of test and inspections required to expedite the Contractors operations.

#### **1.4 EARTHWORK**

- A. The Soils Engineer shall be notified for inspection by the Contractor and shall work in cooperation with the Architect. This inspection shall be made before any excavation is attempted on the site. If any undesirable conditions are encountered during Construction, the Soils Engineer shall be notified so that supplemental recommendations can be made. Tests shall be made to define maximum densities of all compaction work. All densities shall be expressed as a relative compaction, in terms of the maximum dry density obtained in the laboratory. The Soils Engineer shall supervise all engineered fill, and make field tests to insure compliance with the required placement of footings; methods of placing and compacting fills; filter and/or rock fill materials.

#### **1.5 CONCRETE WORK**

- A. Reinforcement shall be positively identified by heat numbers and mill analysis. Otherwise, Contractor shall provide test by qualified laboratory, one test for each 5 tons or fraction thereof, each size and type of reinforcing steel. Cement shall be from tested bins and properly identified at the mixing plant. Contractor shall provide to the testing laboratory, aggregate samples for approval. Testing laboratory shall prepare 3 concrete cylinders for each 25 cubic yards, or fraction thereof placed – 2 cylinders to be tested at 7 days, and 1 cylinder at 28 days. Follow ASTM standards throughout.

1.6 GENERAL TESTS AND INSPECTIONS

- A. Observe all building code test and inspection requirements. Notify proper State, County and City authorities, for their required inspections.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 014529

## **SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

#### **1.2 USE CHARGES**

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
  - 1. Water service is available at project site.
  - 2. Sewer service excludes temporary toilets.
  - 3. Owner will not pay for "bulk water" used during duration of construction.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations..
  - 1. Contractor shall make his/her own provisions for and pay for power used for on-site welding.

#### **1.3 INFORMATIONAL SUBMITTALS**

- A. Site Plan: Locations for temporary facilities, utility hookups, staging areas, and parking areas for construction personnel are indicated on the Civil Drawings.
- B. Erosion- and Sedimentation-Control Plan: Civil Drawings show a "general" erosion and sedimentation-control plan. Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
  2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
  3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials and plastering, and concrete grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of work.
  2. HVAC system isolation schematic drawing.
  3. Location of proposed air-filtration system discharge.
  4. Waste handling procedures.
  5. Other dust-control measures.

#### 1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1, whichever is more stringent.

#### 1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

- A. General: Contractor's option to provide one of the following types of chain-link fencing:
  1. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch-

OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete or galvanized-steel bases for supporting posts.

- B. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- C. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.
- D. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
- E. Plastic Glazing: Refer to Section 088000 for Plastic Glazing Requirements.

## 2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Field office shall be of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
  - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases. Desk for Architect, duplex outlet and internet access.
  - 2. Conference room of sufficient size to accommodate meetings of at least 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
  - 3. Drinking water and private toilet.
  - 4. Coffee machine and supplies.
  - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
  - 6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
  - 1. Store combustible materials apart from building.

## 2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Owner authorizes use of permanent HVAC systems. Where permanent HVAC systems have not been installed, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
  3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures".
  4. De-Humidification Units: Listed and labeled for the area and volume of spaces to be dehumidified, with individual controls for monitoring environmental humidity levels.
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

## PART 3 EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### 3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  1. Connect temporary sewers as directed by authorities having jurisdiction.
  2. Contractor shall be responsible for full costs of cleanout and correction of related damages due to blockages.
- C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures

or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
    - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
    - b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
  2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment.  
  
Isolate limited work within occupied areas using portable dust-containment devices.
- G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- H. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
1. Provide electric distribution system of sufficient size, capacity, and power characteristics required for construction operations.
  2. Connect temporary service to Owner's existing power source, as directed by Owner.
  3. Where capacity of existing system does not meet requirements for construction operations, provide additional electric power service.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
  2. Install lighting for Project identification sign.
- J. Telephone Service: Superintendent shall be available via cellular telephone from the hours of 7:00 am to 5:00 pm.
1. Contractor's Telephone Service: Contractors shall be available during construction via cellular telephone.
  2. At each telephone in common-use facilities, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's field and home office.

- d. Contractor's emergency after-hours telephone number.
- e. Architect's office.
- f. Engineers' offices.
- g. Owner's office.
- h. Principal subcontractors' field and home offices.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
  - 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
  - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Civil Drawings.
  - 1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
  - 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
  - 2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving."
  - 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
  - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
  - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
  - 1. If required by Owner and construction operations, provide temporary parking areas
- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
  - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
  - 2. Remove snow and ice as required to minimize accumulations.



- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
  - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
  - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
    - a. Provide temporary, directional signs for construction personnel and visitors.
  - 3. Maintain and touchup signs so they are legible at all times.
- H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
  - 1. Refer to Section 017419 "Construction Waste Management and Disposal."
- I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- J. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
  - 1. Do not load elevators beyond their rated weight capacity.
  - 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- L. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
  - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.
- M. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
  - 1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of current EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements set forth in approved Storm Water Pollution Prevention Plan (SWPPP).
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
  - 1. Refer to approved Storm Water Pollution Prevention Plan (SWPPP).
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- G. Site Enclosure Fence: Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
  - 1. Extent of Fence: As indicated on Drawings.
- H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight

enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
  2. In the event storefront glass as specified is delayed and will not be installed by the substantial completion date, the General Contractor is responsible for temporarily providing glazing. General Contractor shall provide plastic glazing as indicated in Section 088000 "Glazing". Plastic glazing shall be replaced with permanent glazing after the specified glazing panels are delivered and ready for installation.
- L. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate occupied areas from fumes and noise as deemed necessary by Architect and Owner.
1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
  2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
  3. Insulate partitions to control noise transmission to occupied areas.
  4. Provide foam gasketing, attached to framing and not to construction to remain, to seal joints and perimeter of temporary partition. Equip partitions with gasketed dustproof doors and security locks where openings are required.
  5. Protect air-handling equipment.
  6. Provide walk-off mats at each entrance through temporary partition.
- M. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas.
  2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### 3.5 TEMPORARY SEEDING INSTALLATION

- A. General: Temporary seeding is the establishment of fast growing annual vegetation to provide erosion control for up to twelve (12) months and reduce the amount of sediment moving off the site. Annual plants, which sprout rapidly and survive for only one growing season are suitable for establishing temporary vegetation cover. This practice applies where short-lived vegetation can be established before final grading or in a season not suitable for permanent seeding.
- B. Seed: All seed shall conform to Federal Specification JJJ-S-1816. Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America. Furnish seed on sealed standard containers, labeled in accordance with U.S. Department of Agriculture Rules and Regulations under current Federal Seed Act.
  - 1. Seed which has become wet, moldy, or otherwise damaged in transit or storage will not be acceptable.
- C. Temporary Seed: Provide seed mixture composed of plant species, proportions and minimum percentages of purity, germination and maximum percentage of weed seed as follows for each seed mix:
  - 1.      LBs / Acre    % Purity    % Germ
  - 2.    120 98 85
- D. The preferred method of seeding would be drills for wheat and slit seeding for rye. Sow seed using a slit seeding machine or spreader at 2" centers. Do not seed when wind velocity exceeds 15 miles per hour.
- E. Protect all seeded areas with straw mulch as follows:
  - 1. The contractor shall straw mulch all seeded areas. The straw shall be free of weed seed and such foreign materials that may detract from the effectiveness as mulch, erosion control or impede desired plant growth.
  - 2. Immediately or within twenty-four (24) hours after any given area is seeded, straw shall be evenly placed with a mechanical blower or by hand over all seeded areas at the rate of approximately one and one-half (1-1/2) tons per acre. The proper mulch application when viewed straight down shall appear to be 50% mulch and 50% of the soil surface below. Crimp straw into soil by mechanical means.
  - 3. Any seedbed areas or other work which was damaged as a result of applying the mulch shall be repaired at the discretion of the Architect or Landscape Architect.

### 3.6 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
  - 1. Protect porous materials from water damage.

2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
  - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
  - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
  - c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

### 3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
  1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

- C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  - 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
  - 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

## **SECTION 016000 - PRODUCT REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
  - 1. Section 012100 "Allowances" for products selected under an allowance.
  - 2. Section 012200 "Unit Prices" for products selected under a unit price.
  - 3. Section 012300 "Alternates" for products selected under an alternate.
  - 4. Section 012500 "Substitution Procedures" for requests for substitutions.
  - 5. Section 014200 "References" for applicable industry standards for products specified.

#### **1.2 DEFINITIONS**

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not

meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications.

### 1.3 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
  - 2. Architects Action: For comparable products submitted for "Cause", if necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later. For comparable products submitted for "Contractor's Convenience", Contractor must submit all information necessary to make a direct comparison to specified product for Architect's review, no additional information may be submitted.
    - a. Form of Approval: As specified in Section 012500 "Substitution Procedures."
    - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

### 1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
  - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
  - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.



2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

## 1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. **Manufacturer's Warranty:** Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  2. **Special Warranty:** Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. **Special Warranties:** Prepare a written document that contains appropriate terms and identification, ready for execution.
1. **Manufacturer's Standard Form:** Modified to include Project-specific information and properly executed.
  2. **Specified Form:** When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
  3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. **Submittal Time:** Comply with requirements in Section 017700 "Closeout Procedures."

## PART 2 PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
  4. Where products are accompanied by the term "as selected," Architect will make selection.
  5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
1. Products:
    - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered prior to bidding only.
    - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
  2. Manufacturers:
    - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered prior to bidding only.
    - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
  3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  3. Evidence that proposed product provides specified warranty.
  4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
  5. Samples, if requested.

PART 3 EXECUTION (NOT USED)

END OF SECTION 016000



## **SECTION 017300 - EXECUTION**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Coordination of Owner-installed products.
  - 6. Progress cleaning.
  - 7. Starting and adjusting.
  - 8. Protection of installed construction.
  - 9. Correction of the Work.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for limits on use of Project site.
  - 2. Section 013300 "Submittal Procedures" for submitting surveys.
  - 3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
  - 4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
  - 5. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

#### **1.2 DEFINITIONS**

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

#### **1.3 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For land surveyor or professional engineer.
- B. Certificates: Contractor shall certify that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

## 1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
  2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    - a. Primary operational systems and equipment.
    - b. Fire separation assemblies.
    - c. Air or smoke barriers.
    - d. Fire-suppression systems.
    - e. Mechanical systems piping and ducts.
    - f. Control systems.
    - g. Communication systems.
    - h. Fire-detection and -alarm systems.
    - i. Conveying systems.
    - j. Electrical wiring systems.
    - k. Operating systems of special construction.
  3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
    - a. Water, moisture, or vapor barriers.
    - b. Membranes and flashings.
    - c. Exterior curtain-wall construction.
    - d. Equipment supports.
    - e. Piping, ductwork, vessels, and equipment.
    - f. Noise- and vibration-control elements and systems.
  4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

- D. **Manufacturer's Installation Instructions:** Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. **General:** Comply with requirements specified in other Sections.
- B. **In-Place Materials:** Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. **Existing Conditions:** The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. **Examination and Acceptance of Conditions:** Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. **Written Report:** Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
  - 1. Description of the Work.
  - 2. List of detrimental conditions, including substrates.
  - 3. List of unacceptable installation tolerances.
  - 4. Recommended corrections.

- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish limits on use of Project site.
  - 3. Establish lines and levels of construction and elsewhere as needed to locate work for the Project.
  - 4. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 5. Inform installers of lines and levels to which they must comply.
  - 6. Check the location, level and plumb, of every major element as the Work progresses.
  - 7. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  - 8. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.



- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

### 3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

### 3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
  - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.
- K. Repair or remove and replace damaged, defective, or nonconforming Work.
  - 1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective work.

### 3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with material so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

- E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  6. Proceed with patching after construction operations requiring cutting are complete.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
  2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

### 3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
  3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
  4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
  2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

- D. **Installed Work:** Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. **Concealed Spaces:** Remove debris from concealed spaces before enclosing the space.
- F. **Exposed Surfaces in Finished Areas:** Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. **Waste Disposal:** Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. **During handling and installation,** clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. **Clean and provide maintenance on completed construction** as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. **Limiting Exposures:** Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.9 STARTING AND ADJUSTING

- A. **Start equipment and operating components to confirm proper operation.** Remove malfunctioning units, replace with new units, and retest.
  - 1. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
  - 2. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. **Manufacturer's Field Service:** Comply with qualification requirements in Section 014000 "Quality Requirements."

### 3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. **Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.**
  - 1. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300



## **SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for the following:
  - 1. Salvaging nonhazardous demolition waste.
  - 2. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
  - 1. Section 024119 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.

#### **1.2 DEFINITIONS**

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- E. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

#### **1.3 INFORMATIONAL SUBMITTALS**

- A. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- B. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

#### **1.4 QUALITY ASSURANCE**

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION**

#### **3.1 PLAN IMPLEMENTATION**

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the

Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

### 3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
  3. Store items in a secure area until installation.
  4. Protect items from damage during transport and storage.
  5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
1. Clean salvaged items.
  2. Store items in a secure area until delivery to Owner.
  3. Transport items to Owner's storage area designated by Owner.
- C. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- D. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- E. Plumbing Fixtures: Separate by type and size.
- F. Lighting Fixtures: Separate lamps by type and protect from breakage.
- G. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.



### 3.3 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419



## **SECTION 017700 - CLOSEOUT PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.
  - 5. Repair of the Work.
- B. Related Requirements:
  - 1. Section 017300 "Execution" for progress cleaning of Project site.
  - 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 3. Section 017839 "Project Record Documents" for submitting record Drawings and record Product Data.
  - 4. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.

#### **1.2 ACTION SUBMITTALS**

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

#### **1.3 CLOSEOUT SUBMITTALS**

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

#### **1.4 MAINTENANCE MATERIAL SUBMITTALS**

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

#### **1.5 SUBSTANTIAL COMPLETION PROCEDURES**

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating

- certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
  3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
    - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
  5. Submit test/adjust/balance records.
  6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
  2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  3. Complete startup and testing of systems and equipment.
  4. Perform preventive maintenance on equipment used prior to Substantial Completion.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
  6. Advise Owner of changeover in heat and other utilities.
  7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements, including touchup painting.
  10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of ten (10) days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare

the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

#### 1.6 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
  - a. Project name.

- b. Date.
  - c. Name of Architect
  - d. Name of Contractor.
  - e. Page number.
4. Submit list of incomplete items in the following format:

- a. PDF electronic file. Architect will return annotated file.

#### 1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within fifteen (15) days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
  - 1. General: Provide one (1) electronic copy and one (1) paper copy of warranties.
  - 2. Bind warranties and bonds in heavy-duty, three-ring, white vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
  - 3. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  - 4. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
  - 5. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

#### 1.9 PROJECT CLOSEOUT CHECK LIST

- A. Requirements: Contractor must provide the following prior to the Architect and Construction Manager approving the release of final payment:
  - 1. Verification that final punch list is complete.
  - 2. Final Affidavit.
  - 3. Consent of Surety.
  - 4. Final Lien Waiver.
  - 5. Affidavit of compliance with Prevailing Wage requirements.
  - 6. As-Built drawings applicable to this Contract.

7. Operation and Maintenance Manuals applicable to this Contract.
8. Current Insurance Certificate.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## PART 3 EXECUTION

### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - d. Remove snow and ice to provide safe access to building, as applicable.
    - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - g. Sweep concrete floors broom clean in unoccupied spaces.
    - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - j. Remove labels that are not permanent.
    - k. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    - l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    - m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    - n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
    - o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
    - p. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls."  
  
Prepare written report.

- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

### 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
  - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
  - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
    - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
  - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
  - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700



## **SECTION 017823 - OPERATION AND MAINTENANCE DATA**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems, and equipment.
  - 4. Product maintenance manuals.
  - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
  - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

#### **1.2 DEFINITIONS**

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

#### **1.3 CLOSEOUT SUBMITTALS**

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect and Commissioning Authority, as applicable, will comment on whether content of operations and maintenance submittals are acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
  - 1. General: Provide one (1) pdf electronic file and one (1) paper copy as follows:
    - a. PDF electronic file: Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
      - 1) Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
      - 2) Enable inserted reviewer comments on draft submittals.
    - b. Paper copy: Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will transmit paper copy to Owner upon acceptance.
- C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least thirty (30) days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.

1. Correct or revise each manual to comply with Architect's and, as applicable, Commissioning Authority's comments. Submit copies of each corrected manual within ten (10) days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

## PART 2 PRODUCTS

### 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
  1. List of documents.
  2. List of systems
  3. List of equipment.
  4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

### 2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. General: Submit one (1) paper copy and one (1) copy in pdf electronic file format.
- B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  1. Title page.
  2. Table of contents.
  3. Manual contents.
- C. Title Page: Include the following information:
  1. Subject matter included in manual.
  2. Name and address of Project.

3. Name and address of Owner.
  4. Date of submittal.
  5. Name and contact information for Contractor and Installer (if applicable).
  6. Name and contact information for Architect.
  7. Name and contact information for Commissioning Authority, as applicable.
  8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  9. Cross-reference to related systems in other operation and maintenance manuals.
- D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, white vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
  - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
  - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

### 2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
  1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  1. Fire.
  2. Flood.
  3. Flood.
  4. Gas leak.
  5. Water leak.
  6. Power failure.
  7. Water outage.
  8. System, subsystem, or equipment failure.
  9. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
  1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.

4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

## 2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  2. Performance and design criteria if Contractor has delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.
  10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
  2. Manufacturer's name.
  3. Equipment identification with serial number of each component.
  4. Equipment function.
  5. Operating characteristics.
  6. Limiting conditions.
  7. Performance curves.
  8. Engineering data and tests.
  9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
  2. Equipment or system break-in procedures.
  3. Routine and normal operating instructions.
  4. Regulation and control procedures.
  5. Instructions on stopping.
  6. Normal shutdown instructions.

7. Seasonal and weekend operating instructions.
  8. Required sequences for electric or electronic systems.
  9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## 2.5 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
  2. Manufacturer's name.
  3. Color, pattern, and texture.
  4. Material and chemical composition.
  5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
  2. Types of cleaning agents to be used and methods of cleaning.
  3. List of cleaning agents and methods of cleaning detrimental to product.
  4. Schedule for routine cleaning and maintenance.
  5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

## 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules,

spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

## PART 3 EXECUTION

### 3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.

2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.

2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."



G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823



## **SECTION 017839 - PROJECT RECORD DOCUMENTS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for project record documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
  - 4. Miscellaneous record submittals.
- B. Related Requirements:
  - 1. Section 017300 "Execution" for final property survey.
  - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
  - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

#### **1.2 CLOSEOUT SUBMITTALS**

- A. General: Final Payment will not be made until Project Record Documents are submitted to, reviewed by and are acceptable to the Architect.
- B. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit copies of record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit one paper-copy set(s) of marked-up record prints.
      - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit PDF electronic files of scanned record prints and one (1) paper-copy set of marked-up record prints.
      - 2) Print each drawing, whether or not changes and additional information were recorded.
- C. Record Specifications: Comply with the following:
  - 1. Initial Submittal:
    - a. Submit one paper-copy set(s) of marked-up record specifications.
    - b. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
  - 2. Final Submittal:
    - a. Submit PDF electronic files of scanned and marked-up record specifications.
- D. Record Product Data: Submit one (1) paper copy and one (1) annotated PDF electronic file and directory of each submittal.
  - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

- E. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one (1) paper copy and one (1) annotated PDF electronic file and directory of each submittal.
- F. Reports: Submit written report weekly, indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

## PART 2 PRODUCTS

### 2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one (1) set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
  - 2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  - 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  - 5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files:

1. Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
  - a. Format: Annotated PDF electronic file with comment function enabled.
  - b. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  - c. Refer instances of uncertainty to Architect for resolution.
  - d. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
    - 1) See Section 013300 "Submittal Procedures" for requirements related to use of Architect's digital data files.
    - 2) Architect will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
  - a. Project name.
  - b. Date.
  - c. Designation "PROJECT RECORD DRAWINGS."
  - d. Name of Architect.
  - e. Name of Contractor.

## 2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Refer to previous Article.

### 2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and record Drawings where applicable.

B. Format: Submit one (1) copy of record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

### 2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as one PDF electronic file and a separate paper copy of marked-up miscellaneous record submittals].

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

## PART 3 EXECUTION

### 3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal

working hours.

END OF SECTION 017839 017839





## **SECTION 017900 - DEMONSTRATION AND TRAINING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
  - 3. Pre-Produced demonstration and training videos.
  - 4. Audio Visual and Technical Data Systems.

#### **1.2 INFORMATIONAL SUBMITTALS**

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. Indicate proposed training modules using manufacturer-produced (pre-produced) demonstration and training video recordings for systems, equipment, and products.
- B. Qualifications: For Instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.

#### **1.3 CLOSEOUT SUBMITTALS**

- A. Pre-Produced Demonstration and Training Video Recordings: Submit two (2) copies within seven days of end of training.
  - 1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.
    - b. Name of Architect.
    - c. Name of Contractor.
    - d. Date of video recording.
    - e. Name and address of videographer.
  - 2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
  - 3. At completion of training, submit complete training manual(s) for Owner's use. One copy shall be prepared and bound in format matching operation and maintenance manuals, and the second copy shall be in PDF electronic file format on compact disc.

## 1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- C. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  - 1. Inspect and discuss locations and other facilities required for instruction.
  - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  - 3. Review required content of instruction.
  - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

## 1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

## PART 2 PRODUCTS

### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
  - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.

- d. Regulatory requirements.
  - e. Equipment function.
  - f. Operating characteristics.
  - g. Limiting conditions.
  - h. Performance curves.
2. Documentation: Review the following items in detail:
- a. Emergency manuals.
  - b. Operations manuals.
  - c. Maintenance manuals.
  - d. Project record documents.
  - e. Identification systems.
  - f. Warranties and bonds.
  - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
- a. Instructions on meaning of warnings, trouble indications, and error messages.
  - b. Instructions on stopping.
  - c. Shutdown instructions for each type of emergency.
  - d. Operating instructions for conditions outside of normal operating limits.
  - e. Sequences for electric or electronic systems.
  - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup and shutdown procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
  - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module.  
Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

### 3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. Coordinate with Owner for number of participants, instruction times and location.
  - 2. Describe system design, operational requirements, criteria and regulatory requirements.
  - 3. Owner will furnish Contractor with names and positions of participants.
    - a. Owner will have in attendance a participant to describe Owner's operational philosophy.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner, through Architect, with at least seven (7) days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

### 3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. Pre-Produced Video Recordings. Video recordings may be used as a component of each training module. Upon completion of training, furnish to Owner one (1) copy of each video used for training.

END OF SECTION 017900

## **SECTION 024119 - SELECTIVE DEMOLITION**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Demolition and removal of selected portions of building or structure as indicated, and as required to accommodate new construction.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

**B. Related Requirements:**

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.
3. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

#### **1.2 DEFINITIONS**

- A. Remove:** Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage:** Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall:** Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain:** Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle:** To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

#### **1.3 MATERIALS OWNERSHIP**

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.**
1. Owner will retain "first right of refusal" for all demolished items.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.**

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

#### 1.4 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
  1. Inspect and discuss condition of construction to be selectively demolished.
  2. Review structural load limitations of existing structure.
  3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  5. Review areas where existing construction is to remain and requires protection.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Selective Demolition Activities: Indicate the following:
  1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
  2. Interruption of utility services. Indicate how long utility services will be interrupted.
  3. Coordination for shutoff, capping, and continuation of utility services.
  4. Use of elevator and stairs.
  5. Coordination of Owner's continuing occupancy of portions of existing building to ensure uninterrupted progress of Owner's on-site operations and of Owner's partial occupancy of completed Work.
- D. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.
  1. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

## 1.6 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.
  - 1. Prior to commencement of demolition, representatives of the Owner and the Contractor will inspect the project areas where work will be conducted, and designate items to be salvaged. Items to be salvaged shall be identified by tagging/labeling and listed on the inventory.

## 1.7 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

## 1.8 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
  - 1. Before selective demolition, Owner will remove the following items:
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
  - 2. Contractor and Owner's forces shall each conduct work according to all applicable OSHA and EPA regulations.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

## 1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:
  - 1. Roof Warranty.
- B. Notify warrantor on completion of selective demolition and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

## 1.10 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

## PART 2 PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
  - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
  - 2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
  - 3. Submit reports, photographs, and electronic files within seven (7) calendar days of Notice to Proceed.

### 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
  - 1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary"
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
  - 2. Arrange to shut off utilities with utility companies.
  - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.



4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
  - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
  - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
  - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
  - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
  - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.
- C. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

### 3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  4. Cover and protect furniture, furnishings, and equipment that have not been removed.
  5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."
- C. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- D. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.
- E. Remove temporary barricades and protections where hazards no longer exist.

### 3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
  3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  5. Maintain adequate ventilation when using cutting torches.
  6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

9. Locate temporary wall/knockout panels and remove to extent indicated, minimizing damage to existing adjacent construction to remain.
  10. Dispose of demolished items and materials promptly.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Store items in a secure area until delivery to Owner.
  4. Transport items to Owner's storage area designated by Owner.
  5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
  2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  3. Protect items from damage during transport and storage.
  4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

### 3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

F. Wood Trim and Plaster: Carefully remove wood trim adjacent to interior plaster work to minimize damage to plaster work to remain. Remove loose plaster back to solid/sound plaster.

### 3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

### 3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

## **SECTION 033000 - CAST-IN-PLACE CONCRETE**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes cast-in-place concrete (033000.A01), including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Footings and trench footings (grade beams).
  - 2. Foundation walls and stem walls.
  - 3. Slabs-on-grade.
  - 4. Elevated slabs over metal deck.
  - 5. Light pole bases
- B. This Section also includes the following:
  - 1. Providing the granular drainage fill course beneath building floor slabs on grade.
  - 2. Providing foundation insulation.
- C. Related Requirements:
  - 1. Section 012200 "Unit Prices" for unit prices relating to work of this Section.
  - 2. Section 012300 "Alternates" for alternates effecting work of this Section.
  - 3. Section 033523 "Polished Concrete Finishing" for applications of polished concrete finishes and protection of slab surfaces prior to polishing.
  - 4. Section 321313 "Concrete Paving" for concrete pavement and walks.

#### **1.2 DEFINITIONS**

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. Reveal: Projection of coarse aggregate from matrix or mortar after completion of exposure operations.
- C. W/C Ratio: The ratio by weight of water to cementitious materials.

#### **1.3 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
    - a. Architect and Engineer.
    - b. Contractor's superintendent.
    - c. Independent testing agency responsible for concrete design mixtures.
    - d. Owner's testing agency.
    - e. Ready-mix concrete manufacturer.
    - f. Concrete Subcontractor.
    - g. Flatwork technicians.

- h. Manufacturer's representative for waterproofing admixture.
- i. Concrete polishing subcontractor.
- 2. Review special inspection and testing and inspecting agency procedures for the following:
  - a. Field quality control.
  - b. Concrete finishes and finishing.
  - c. Cold- and hot-weather concreting procedures.
  - d. Curing procedures.
  - e. Construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers.
  - f. Forms and form removal limitations.
  - g. Vapor-retarder installation.
  - h. Anchor rod and anchorage device installation tolerances.
  - i. Steel reinforcement installation.
  - j. Methods for achieving specified floor and slab flatness and levelness.
  - k. Measurement of floor and slab flatness and levelness.
  - l. Perimeter insulation installation.
  - m. Waterproofing admixture.
  - n. Requirements for slabs to receive polished concrete.
  - o. Concrete repair procedures.
  - p. Concrete protection.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
    - a. Batch delivery tickets shall indicate batch weights as well as amount of available water to add on each delivery ticket.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Jointing Layout: Submit floor plans indicating proposed layout and locations for joints required to construct the structure, including but not limited to the following:
  - 1. Location of expansion joints.
  - 2. Location of construction and control joints. Locations are subject to approval of the Architect.
  - 3. Include locations for decorative saw cutting of joints associated with floors indicated to receive polished concrete finish.
- E. Samples: For each of the following materials:
  - 1. Form-facing panels.
  - 2. Form ties.
  - 3. Form liners.
  - 4. Coarse- and fine-aggregate gradations.
  - 5. Chamfers and rustications.
  - 6. Vapor retarder.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer and testing agency.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Steel reinforcement and accessories.
- D. Material Test Reports: For the following, from a qualified testing agency indicating compliance with requirements:
  - 1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
  - 1. Include details of decorative formwork matching design shown on drawings.
- F. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.
- G. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- H. Field quality-control reports.
- I. Minutes of preinstallation conference.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
  - 1. Installer of concrete topping slabs indicated to receive polished concrete finish and structural cast-in-place concrete slab shall be same as installer for polished concrete finishes.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
  - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
  - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
  2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
1. Waterproofing (capillary break) admixture manufacturer will test new concrete slabs for permeability.
- H. Mockups for Polished Slab-on-Grade Concrete: Form, reinforce and cast concrete slab-on-grade to receive polished concrete finish. Mockup panels shall demonstrate typical joints, surface finish, texture, tolerances and standard of workmanship. Pour slab over vapor retarder.
1. Size of mockup sample area shall not be less than 10 by 10 feet. Refer to Drawings for actual mockup dimensions and location of slab on grade to receive topping slab and polished concrete finish.
    - a. Mockup for slab shall include adjacent masonry walls to demonstrate finish of polished concrete wall edges and corners.
  2. Concrete for slab shall be same mix design used for Project.
  3. Protect and maintain approved mockup during construction in an undisturbed condition as standard for judging completed work.
  4. Demolish and legally dispose of mockup after date established for Substantial Completion.
  5. Refer to Section 033523 "Polished Concrete Finish" for additional requirements regarding polishing of concrete topping slab.
- I. Mockup for Existing Slabs to receive Polished Concrete Finish: Select area to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship. Existing concrete shall be of same mix design to be used in location of actual existing slabs to receive polished concrete finish.
1. Consult with Architect and Owner to locate an area that will be used for the field sample of the polished concrete finish. Size of field sample area shall not be less than 9 by 9 feet, and shall include one corner of the room.
  2. Mockups shall remain undisturbed until time of Substantial Completion of polished concrete finishing for elevated slabs. Upon acceptance of staining and polishing of elevated slabs, mockup will receive floor finish as indicated on Material Finish Legend.



## 1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.
- C. Protect foam plastic insulation as follows:
  - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site before installation time.
  - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## 1.9 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and as follows:
  - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
- C. Concrete surfaces shall be protected by means recommended in writing my polishing product manufacturer.
  - 1. Protection of Slabs to receive Polished Concrete Finishes: Refer to Section 033523 "Decorative Polished Concrete Finishes."

## PART 2 PRODUCTS

### 2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301.
2. ACI 303.1.
3. ACI 117.
4. ACI 360.

### 2.2 FORM-FACING MATERIALS

- A. Form-Facing Panels for As-Cast Finishes: Exterior-grade plywood panels, nonabsorptive, that will provide continuous, true, and smooth architectural concrete surfaces, medium-density overlay, Class 1, or better, mill-applied release agent and edge sealed, complying with DOC PS 1.
- B. Smooth-Formed Finished Concrete (033000.A16): Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
    - a. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
  2. Metal, or other approved panel materials.
- C. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- F. Foam Void Fill (Geofoam) (033000.A04): Refer to Article later in this Section.
- G. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum; nonstaining; in longest practicable lengths.
- H. Rustication Strips (033000.A05): Metal, dressed wood, or rigid plastic, or with sides beveled and back kerfed; nonstaining; fabricated to configurations indicated, in longest practicable lengths.
1. Chamfer strips shall be 3/4 by 3/4 inch, minimum.
- I. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- J. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

## 2.3 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
- B. Reinforcing Bars (033000.A06): ASTM A 615/A 615M, Grade 60, deformed.
- C. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.
- D. Deformed-Steel Wire: ASTM A 1064/A 1064M.
- E. Plain-Steel Welded-Wire Reinforcement (033000.A09): ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- F. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

## 2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
  2. Slab –on-grade supports: Provide supports specifically designed for bearing on soil.
  3. Where legs of wire bar supports contact forms, use CRSI Class 1, gray, plastic-protected bar supports.

## 2.5 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
  1. Portland Cement: ASTM C 150/C 150M, Type I or Type III, gray.
  2. Fly Ash: ASTM C 618, Class C.
    - a. Fly ash may not be used for concrete slabs on grade and elevated concrete slabs indicated to receive a polished concrete finish.
- C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size:
    - a. 1-inch nominal for slabs on grade and foundations.
    - b. 3/4-inch nominal for elevated slabs.
    - c. 3/4-inch nominal for all other locations.
  2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C 260/C 260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  2. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  3. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  4. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- F. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.
- G. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
- H. Waterproofing (Capillary Break) Admixture: Admixture shall be formulated to react with water and alkali in the concrete to fill the capillaries within the concrete with calcium silicate hydrate. Admixture shall also have plasticizing properties. Admixture shall be used in lieu of a portion of the mix water, not in addition to the mix water.
1. Manufacturer's Warranty: Submit manufacturer's standard warranty executed by an authorized company official. Manufacturer's warranty is in addition to, and not a limitation of other rights Owner may have under provisions of the Contract Documents.
    - a. Warranty Period: Ten (10) years commencing on the date of acceptance of the Project by Owner or date of Substantial Completion, whichever is earliest.
    - b. Warranty Terms: Terms to include moisture related failures, including all finish floor materials and labor.
  2. Admixture Manufacturers and Products:
    - a. Concre Systems; Concre.
    - b. Specialty Products Group (SPG); VaporLock 20/20.
    - c. Barrier One International; Barrier One.
  3. Accessories materials:
    - a. Topical vapor sealer as necessary when results from moisture testing by waterproofing admixture manufacturer indicate moisture vapor emission and/or relative humidity with slab exceeding acceptable levels.
  4. Locations to receive Waterproofing Admixture:

- a. New slabs-on-grade and elevated slabs.
    - b. Trenches within existing slabs-on-grade.
    - c. Use of waterproofing admixture at polished concrete shall be coordinated with concrete polisher prior to installation.
  - I. Water: ASTM C 94/C 94M and potable.
- 2.6 VAPOR RETARDERS (033000.A14)
- A. Sheet Vapor Retarder: ASTM E 1745, Class A, except with maximum perm rating of 0.01 US perms, a minimum puncture resistance of 2260 grams and a minimum tensile strength of 57 lbf/in. Include manufacturer's recommended adhesive or pressure-sensitive tape.
    - 1. Products: Subject to compliance with requirements, provide one of the following:
      - a. Insulation Solutions, Inc.; Viper VaporCheck II, 15 mil, Class A.
      - b. Inteplast Group; Barrier-Bac VB-350, 16 mil.
      - c. Meadows, W. R., Inc.; Perminator 15 mil.
      - d. Poly-America; Husky Yellow Guard, 15 mil.
      - e. Raven Industries Inc.; Vapor Block 15.
      - f. Stego Industries, LLC.; Stego Wrap Vapor Barrier 15 mil.
- 2.7 GRANULAR DRAINAGE/ CAPILLARY BREAK MATERIAL
- A. Granular Drainage Fill (033000.A15): Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- 2.8 PERIMETER INSULATION
- A. Foam-Plastic Board Insulation (072100.A01): Provide one of the following:
    - 1. Provide extruded-polystyrene board insulation complying with ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
      - a. Type IV, 25 psi.
    - 2. Provide molded polystyrene board insulation complying with ASTM C 578.
      - a. Type IX, 25 psi.
      - b. Basis-of-Design Product: ACH Foam Technologies; "Foam-Control Plus+ 250".
- 2.9 LIQUID FLOOR TREATMENTS (033000.A21)
- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces, while improving slip resistance.
    - 1. Basis-of-Design Products: Subject to compliance with requirements, provide Curecrete Distribution Inc.; "Ashford Formula" or comparable product meeting specified performance requirements, submitted to and accepted by Architect prior to bidding.
    - 2. Performance Criteria:
      - a. Abrasion Resistance: Improves abrasion resistance by not less than 30 percent over untreated concrete when tested in accordance with ASTM C 779.
      - b. Coefficient of Friction: ASTM C 1028, on steel-troweled concrete samples versus tile, reduces slippage as follows:
        - 1) Dry: 0.71 untreated and with treatment not less than 0.86.

- 2) Wet: 0.47 untreated and with treatment not less than 0.69.
- c. Hardening: Improves hardness by not less than 35 percent over untreated concrete when tested in accordance with ASTM C 39 after 28 days.
- d. Impact Resistance: Improves impact resistance by not less than 13 percent over untreated concrete when tested in accordance with ASTM C 805, rebound number.
- 3. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

## 2.10 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. BASF Construction Chemicals - Building Systems; Confilm.
    - b. Conspec by Dayton Superior; Aquafilm.
    - c. Dayton Superior Corporation; Sure Film (J-74).
    - d. Euclid Chemical Company (The), an RPM company; Eucobar.
    - e. L&M Construction Chemicals, Inc.; E-CON.
    - f. Meadows, W. R., Inc.; EVAPRE.
    - g. SpecChem, LLC; Spec Film
    - h. Unitex; PRO-FILM.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
  - 1. For areas to receive decorative polished concrete, use membrane forming curing compound.
- C. Clear, Waterborne, Membrane-Forming Curing Compound (Exterior Slabs Only): ASTM C 309, Type 1, Class B, dissipating.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. BASF Construction Chemicals - Building Systems; Kure 200.
    - b. Conspec by Dayton Superior; W.B. Resin Cure.
    - c. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
    - d. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
    - e. L&M Construction Chemicals, Inc.; L&M Cure R.
    - f. Meadows, W. R., Inc.; 1100-CLEAR.
    - g. SpecChem, LLC; Spec Rez Clear.
  - 2. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
  - 3. For use in areas with exterior concrete flatwork not indicated within Civil Drawings.

## 2.11 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips (033000.A22): ASTM D 1751, asphalt-saturated cellulosic fiber or W. R. Meadows; "Deck-O-Foam". Thickness for expansion joint filler strip shall be ½ inch, unless otherwise indicated.
  - 1. For isolation joint filler strips, provide 30# asphalt saturated felt.

- B. Semi-rigid Joint Filler (033000.A23): Two-component, semi-rigid, 100 percent solids, aromatic polyurea with a Type A shore durometer hardness range of 85 to 95 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
  - 1. Types I and II, nonload bearing and Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Temporary Floor Protection System: Subject to compliance with requirements provide "Ram Board" by Ram Board or a comparable product submitted to and accepted by Architect prior to bidding with the following product characteristics.
  - 1. Description: Fiber-reinforced protection board designed to allow new concrete to cure while absorbing impacts
  - 2. Material Thickness: 46 mils
  - 3. Wall Guard Feature: Board shall be designed by manufacturer to fold for protection of adjacent walls up to 8 inches above finished floor.
  - 4. Floor protection systems requiring application of a liquid base coat shall be prohibited.
  - 5. Provide manufacturer's recommended seaming tape, vapor curing tape, and edge tape at locations recommended in writing by manufacturer.

## 2.12 REPAIR MATERIALS

- A. Pre-Manufactured Self-Leveling Repair Topping: Hydraulic cement-based, high performance, self-leveling architectural topping.
  - 1. Basis-of-Design Product: Rapid Set; "TRU PC", color gray.
- B. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
  - 1. Basis of Design: Subject to compliance with requirements, Provide "Ultraplan 1 Plus" by MAPEI or a comparable product with the following characteristics .
  - 2. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 3. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 4. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
  - 5. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

- C. Repair Overlay: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
  - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

#### 2.13 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Use fly ash, as needed to reduce the total amount of portland cement, which would otherwise be used, by not more than 15 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  - 1. Fly Ash: 15 percent.
  - 2. Fly ash is not allowed in slabs on grade and elevated slabs indicated to receive the polished concrete finish.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 to 0.30 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
  - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
  - 4. Use corrosion-inhibiting admixture in concrete mixtures for exterior concrete.
  - 5. Use waterproofing (capillary break) admixture in concrete mixtures for slabs on grade and trenching repair for existing slabs on grade.

#### 2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings and Grade Beams: Proportion normal-weight concrete mixture as follows:



1. Minimum Compressive Strength: 4000 psi at 28 days.
  2. Maximum Water-Cementitious Materials Ratio: 0.51.
  3. Slump Limit: 4, plus or minus 1 inch.
  4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.
- B. Foundation Walls and Fin Walls: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
  2. Maximum Water-Cementitious Materials Ratio: 0.51.
  3. Slump Limit: 4 inches, plus or minus 1 inch or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture.
  4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
- C. Slabs-on-Grade (Exterior stoop slabs and stairs): Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
  2. Maximum Water-Cementitious Materials Ratio: 0.45.
  3. Slump Limit: 4 inches, plus or minus 1 inch.
  4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
- D. Slabs-on-Grade (Interior): Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
  2. Maximum Water-Cementitious Materials Ratio: 0.42.
  3. Slump Limit: 4 inches, plus or minus 1 inch.
  4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
- E. Elevated Slabs (Slabs-on-Deck): Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
  2. Maximum Water-Cementitious Materials Ratio: 0.42.
  3. Slump Limit: 3 inches, plus or minus 1 inch.
  4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
  5. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 4 lb/cu. yd.
- F. Lean Concrete: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 1500 psi at 28 days.

2. Maximum Water-Cementitious Materials Ratio: As acceptable to Geotechnical Engineer, Structural Engineer, and Architect.
3. Slump Limit: As acceptable to Geotechnical Engineer, Structural Engineer, and Architect.

#### 2.15 FABRICATING FOAM VOID FILL (GEOFOAM)

- A. Fabricate Geofoam blocks, square, and true to dimension.
- B. Factory cut individual blocks for delivery to site and installation without the need for subsequent field cutting.
  1. Collect cut-off waste at factory for recycling as post-industrial content. Do not require field fabrication and disposal of Geofoam in the field.
- C. Marking and Identification: Individual Geofoam blocks shall be marked as follows:
  1. Room number identification.
  2. Layer I.D. letter and part number identification.

#### 2.16 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

#### 2.17 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
  1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
  2. Waterproofing (Capillary Break) Admixture shall be added at the jobsite before discharge in accordance with admixture manufacturer's written instructions. The admixture manufacturer's representative shall be present at time of dosing admixture and initial concrete placement. Use for all concrete slabs on grade and elevated slabs.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
  1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
  3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

4. Waterproofing (Capillary Break) Admixture shall be added at the jobsite before discharge in accordance with admixture manufacturer's written instructions. The admixture manufacturer's representative shall be present at time of dosing admixture and initial concrete placement. Use for all concrete slabs on grade and elevated slabs.

## PART 3 EXECUTION

### 3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).
  1. Form recessed slabs as indicated.
- C. Utilize sides of trenches for forms whenever possible. Where sides of trenches cannot be used; design, erect, support and maintain formwork to support vertical, lateral, static and dynamic loads that might be applied until such loads can be supported by concrete structure.
- D. Limit deflection of form-facing panels to not exceed ACI 303.1 requirements.
- E. In addition to ACI 303.1 limits on form-facing panel deflection, limit cast-in-place concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
  1. Class A, 1/8 inch for smooth-formed finished surfaces.
    - a. Fins shall be ground smooth with adjacent concrete surface.
  2. Class C, 1/2 inch for rough-formed finished surfaces.
- F. Construct forms tight enough to prevent loss of concrete mortar.
- G. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  1. Kerf wood rustications, keyways, reglets, recesses, and the like, for easy removal.
  2. Do not use rust-stained steel form-facing material.
  3. Construct forms tight enough to prevent loss of concrete mortar.
- H. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- I. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

- J. Chamfer exterior corners and edges of permanently exposed concrete.
- K. Ease edges of tread-to-riser transitions of concrete riser platforms of seating to dimension as indicated on the drawings.
- L. Form openings, chases, offsets, sinkages, keyways, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- M. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- N. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- O. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
  - 1. Coat contact surfaces of wood rustications and chamfer strips with sealer before placing reinforcement, anchoring devices, and embedded items.

### 3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

### 3.3 PERIMETER INSULATION

- A. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
- B. On vertical footing and foundation wall surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
  - 1. If not otherwise indicated, extend insulation a minimum of 36 inches below exterior grade line.

### 3.4 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
  2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
  3. Do not cut or puncture vapor retarder.
  4. Schedule form removal to maintain surface appearance that matches approved field sample panels and mockups.
  5. Cut off and grind glass-fiber-reinforced plastic form ties flush with surface of concrete.
- B. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 75 percent of 28-day design compressive strength. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### 3.5 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

### 3.6 GRANULAR DRAINAGE FILL

- A. Granular Drainage/Capillary Break Fill Course: Cover vapor retarder with not less than indicated depth of granular drainage fill material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 1/2 inch.
1. Compaction Requirements: Compact to within 95 percent maximum density in accordance with ASTM C 698, Standard Proctor compaction, at workable moisture content.
  2. At trenches through existing slabs on grade, provide at additional granular drainage fill/capillary break material to achieve a thickness of not less than 4 inches.
  3. Refer to Section 313200 "Subsoil Stabilization" for additional requirements regarding granular drainage fill.

### 3.7 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders for Slabs on Grade: Following leveling and tamping of granular drainage fill course for building slabs on grade, place vapor retarder sheet with longest dimension parallel with direction of pour. Place, protect, and repair sheet vapor retarder according to ASTM E 1643, manufacturer's written instructions and as follows:
1. Lap joints 6 inches and seal with manufacturers' recommended tape.
  2. Lap vapor retarder over and seal to footings, foundation, strip footings, grade beam and any edge of slab that terminates at existing building conditions, as occurs.
  3. Seal pipe penetrations with pipe boot made from vapor retarder material, seal with pressure sensitive tape and vapor retarder manufacturer's recommended mastic.
  4. Repair punctures and tears with patches of vapor retarder material, lapping 6 inches on all sides and sealing with pressure sensitive tape.
- B. Sheet Vapor Retarders at Trenches in Existing Slabs on Grade: At trenches through existing slabs on grade, place vapor retarder over granular drainage fill/capillary break material and bring up tight to sides of opening to receive concrete. Extend vapor retarder up sides 2 inches and seal with asphaltic mastic. Lap joints 6 inches and seal with vapor retarder manufacturer's recommended mastic or pressure sensitive tape. Repair tears and punctures with patches of vapor retarder material lapping 6 inches on all sides of puncture/tear and seal with mastic or pressure sensitive tape. Seal all penetrations.

### 3.8 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

### 3.9 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
  - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
  - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
  - 5. Space vertical joints in walls at 100 feet maximum. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
  - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  - 8. At Load Transfer Joints: Provide one of the following:
    - a. 2 by 4 inch continuous keyway.
    - b. One #4 by 12 inch long smooth dowel.
    - c. Diamond dowel system.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
  - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
    - a. Where joints are not specifically indicated, space joints at 15 feet on center (area not to exceed 225 sq ft.). For polished concrete, space joints at 10 feet on center (area not to exceed 100 sq ft.).
    - b. Begin saw cutting of joint no later than 12 hours after finishing.
    - c. For topping slabs, space joints according to accepted layout plan and no greater than 8 feet on center each way.
- D. Contraction Joints in Elevated Slabs: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth, but not greater than one-third, of concrete thickness as follows:
  - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or

otherwise damage surface and before concrete develops random contraction cracks.

- a. Where joints are not specifically indicated, space joints at 20 feet on center (area not to exceed 400 sq ft.).
  - b. Begin saw cutting of joint no later than 12 hours after finishing.
  - c. For topping slabs, space joints according to accepted layout plan and no greater than 8 feet on center each way.
- E. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
  2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- F. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

### 3.10 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless water was withheld at batch plant, amount withheld was documented in writing and adding withheld water is acceptable to Architect.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
  2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
    - a. Refer to ACI 303.1 for areas to receive architectural concrete finishes.
  3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
    - a. Do not permit vibrators to contact forms.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.



2. Maintain reinforcement in position on chairs during concrete placement.
  3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  4. Slope surfaces uniformly to drains where required.
  5. Concrete slab repairs at trenches shall be flush with adjacent concrete surface.
  6. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- F. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.11 FINISHING FORMED SURFACES

- A. General - Architectural Concrete Finish: Match Architect's design reference sample, identified and described as indicated, to satisfaction of Architect.
- B. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- C. Smooth-Formed Finish (033000.A16): As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

- D. Rubbed Finish (033000.A17): Apply the following to smooth-formed-finished as-cast concrete where indicated:
  - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
    - a. Apply to concrete surfaces exposed to public view on vertical surfaces of sides of ramps, at sides of stairs and at lightpole bases.
- E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.12 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
  - 1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, and built-up or membrane roofing.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system. Do not burnish concrete.
  - 2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
    - b. Specified overall values of flatness, F(F) 30; with minimum local values of flatness of F(F) 24; for elevated slabs.
    - c. Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24, for slabs to receive polished concrete finish.
  - 3. Gymnasium Floor: Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
  - 4. Finish slab repairs at trenches to be flush with adjacent concrete surfaces.

- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
  - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish (033000.A18): Apply a broom finish to traffic surfaces of exterior concrete platforms, steps, ramps, and elsewhere as indicated.
  - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

### 3.13 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
  - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
  - 2. Construct concrete bases 4 inches high unless otherwise indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
  - 3. Minimum Compressive Strength: 3500 psi (24.1 MPa) at 28 days.
  - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
  - 5. For supported equipment, install anchor bolts that extend through concrete base and anchor into structural concrete substrate.
  - 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

### 3.14 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply

according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, as follows:
  - 1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
    - a. Use moisture-retaining covers to cure concrete slab surfaces to receive all types of floor coverings.
    - b. Use moisture-retaining covers to cure concrete slab surfaces to receive penetrating liquid floor treatments, sealed concrete floor treatments and decorative polished concrete floor treatment.
  - 2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
    - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
- F. Temporary Floor Protection System:
  - 1. Cover polished concrete floors with temporary floor protection system prior to and after completion of polished concrete floor finish.
  - 2. Temporary floor protection system shall be maintained in good condition as recommended by manufacturer until construction activities are complete.

### 3.15 LIQUID FLOOR TREATMENT APPLICATION

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
  - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
  - 2. Do not apply to concrete that is less than 28 days' old.
  - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

### 3.16 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
  - 1. Defer joint filling until concrete has aged at least four month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.
  - 1. Where control/contraction joints extend to the exterior of the building, beyond aluminum storefront, curtain wall and similar framing, completely fill joints with semi-rigid joint filler from exterior to inside face of framing. Exposed joint shall be completely filled and made water-tight.
  - 2. Where control/contraction joints occur in floors indicated to receive penetrating sealed concrete finish.

### 3.17 CONCRETE SURFACE REPAIRS

- A. Where depressions occur from walk-off mats, fill area with pre-manufactured self-leveling repair topping.
- B. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- C. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- E. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- F. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- G. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.18 FIELD QUALITY CONTROL

- A. Special Inspections and Testing: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
  - 1. Waterproofing (capillary break) admixture manufacturer shall test new concrete slabs for permeability.
- C. Inspections:
  - 1. Steel reinforcement placement.
  - 2. Steel reinforcement welding.
  - 3. Headed bolts and studs.
  - 4. Verification of use of required design mixture.
  - 5. Concrete placement, including conveying and depositing.
  - 6. Curing procedures and maintenance of curing temperature.
  - 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
  - 8. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  - 3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
  - 5. Compression Test Specimens: ASTM C 31/C 31M.
    - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
  - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    - a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
  8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
  9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
  10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
  11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
  12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
  13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 72 hours of initial concrete placement.

### 3.19 PROTECTION OF FLOOR TREATMENTS

- A. Protect floor treatments from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by floor treatments installer.

### 3.20 PROTECTION OF FLOORS TO RECEIVE CONCRETE POLISHING

- A. Protect polished concrete floor finish from damage and staining during construction operations. Where temporary covering is required for this purpose, comply with chemical manufacturer's recommendations for protective materials and method of their application. Remove temporary covering just prior to cleaning and final inspection.

END OF SECTION 033000



## **SECTION 033523 - POLISHED CONCRETE FINISHING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes provision for decorative polished concrete floor finish, including but not limited to:
  - 1. Preparation of cast-in-place concrete floor slabs.
    - a. Joint and crack filling.
    - b. Grinding and surface preparation.
  - 2. Dry or Wet Polishing Concrete Methods.
    - a. Mechanical grinding and polishing to achieve surface microtexture range.
    - b. Application of concrete hardener.
    - c. Chemically treating and mechanically refining slab to prevent vapor and stain transmission.
  - 3. Cleaning and filling contraction/control joints in slabs.
  - 4. Curing protection, high traction dynamic coefficient of friction (DCOF) baseline and handover of finished floor.

#### **1.2 REFERENCES**

- A. ASTM International
  - 1. ASTM C 779 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
  - 2. ASTM C 309 Standard Test Method for Liquid Membrane-Forming Compounds for Curing Concrete
  - 3. ASTM E 96 Standard Test Method for Water Vapor Transmission of Materials
- B. Concrete Polishing Council (CPC).
- C. National Floor Safety Institute (NFSI):
  - 1. NFSI Test Method 101-A AStandard for Evaluating High-Traction Flooring Materials, Coatings and Finishes.”
  - 2. ANSI B101.3 Test Method for Measuring Wet DCOF of Common Hard-Surface Floor Materials
    - a. National Floor Safety Institute 817.749.1700, [www.NFSI.org](http://www.NFSI.org).
- D. OSHA Regulatory and other References:
  - 1. 29 CFR 1926.1153 Crystalline Silica Standard.
  - 2. ASME B46.1-2009 (R2002), Surface Texture Grade (Surface Roughness, Waviness, and Lay).

#### **1.3 DEFINITIONS**

- A. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of polished concrete.
- B. Refined Polished Concrete Floor Finish: Defined as mechanical multi diamond concrete processing that creates non-peeling calcium silicate hydrate (C-S-H) layer that is physically resilient to wear and dusting, chemically resistant to staining and vapor transmission and has high traction Dynamic Coefficient of Friction (DCOF) as defined by ANSI B101.3 requirements.

- C. Stain and Vapor Resistant Finish: A polished concrete floor finish meeting ASTM E96 and ASTM C309 without negatively affecting performance of DCOF.
- D. Polished Concrete Aggregate Exposure Classifications as defined by CPC:
1. Class A – Cement Fines Finish: Surface exposure shall be as follows:
    - a. 85 to 95 percent cement fines.
    - b. 5 to 15 percent fine aggregate.
  2. Class B - Fine Aggregate Finish: Surface exposure shall be as follows:
    - a. 85 to 95 percent fine aggregate.
    - b. 5 to 15 percent blend of cement fines and coarse aggregate.
  3. Class C - Coarse Aggregate Finish: Surface exposure shall be as follows:
    - a. 80 to 90 percent coarse aggregate.
    - b. 10 to 20 percent blend of cement fines and fine aggregate.
- E. Distinctness-of-Image (DOI) Gloss: The sharpness of images of objects produced by reflection at a polished surface, sometimes called “image clarity”.
1. Measurement by Image Clarity Meter according to ASTM D 5767: The DOI, Image Clarity Value, obtained from this test method shall range from 0 to 100 with a value of 100 representing perfect DOI (image clarity).
- F. Haze: The cloudiness or milky appearance of images of objects produced by reflection in a polished surface.
1. Measurement by Glossmeter according to ASTM D 4039: The Haze Index, obtained from this test method , is computed by using the numeric difference between the value of specular gloss at 60 degrees and the value of specular gloss at 20 degrees.
- G. Polished Concrete Appearance Levels as defined by CPC:
1. Level 1 – Flat (Ground) Appearance: Images of objects being reflected have a flat appearance.
    - a. DOI Image Clarity Value: 0 to 9 percent.
    - b. Haze Index: Less than 10 percent.
  2. Level 2 – Satin (Honed) Appearance: Images of objects being reflected have a matte appearance.
    - a. DOI Image Clarity Value: 10 to 39 percent.
    - b. Haze Index: Less than 10 percent.
  3. Level 3 – Polished Appearance: Images of objects being reflected do not have a sharp and crisp appearance but can be easily identified.
    - a. DOI Image Clarity Value: 40 to 69 percent.
    - b. Haze Index: Less than 10 percent.
  4. Level 4 – Highly Polished Appearance: Images of objects being reflected have a sharp and crisp appearance as would be seen in a near-mirror like reflection. May require grouting.
    - a. DOI Image Clarity Value: 70 to 100 percent.
    - b. Haze Index: Less than 10 percent.
- H. Dynamic Coefficient of Friction (DCOF): The ratio of the horizontal component of force applied to a body required to overcome resistance to movement when the body is already in motion divided by the vertical component of the weight of the body or force applied to the surface where movement occurs.

- I. Dynamic Wet Coefficient of Friction (DWCOF): Defined as the frictional resistance created once an object is already in motion and in wet conditions. This value shall be determined in accordance with ANSI/NFSI B101.3.
- J. Surface Texture Grade (STG)/Roughness Average (Ra): Defined as the average value of profile heights as determined in accordance with ASME B46.1 – Surface Texture Grade (STG). Units of measure are  $\mu\text{in}$  (microinches).
  - 1. Refinement Levels: Defined as a visual function of the Roughness Average (Ra) as follows:
    - a. Matte Finish: 32  $\mu\text{in}$  (microinches)
    - b. Satin: 24  $\mu\text{in}$  (microinches)
    - c. SemiGloss: 16  $\mu\text{in}$  (microinches)
    - d. Glossy: 6  $\mu\text{in}$  (microinches)

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Prior to placing concrete for areas scheduled to receive decorative polished concrete finish, conduct conference at Project site to comply with requirements in applicable Division 1 Sections and as follows:
  - 1. Required Attendees
    - a. Owner and Architect.
    - b. Contractor, including supervisor/lead foreman.
    - c. Concrete producer.
    - d. Concrete finisher, including supervisor/lead foreman.
    - e. Concrete polisher, including supervisor/lead foreman.
    - f. Technical representative of each type of liquid applied product manufacturer.
    - g. Independent testing agency responsible for concrete design mixtures.
  - 2. Agenda: Polisher shall demonstrate understanding of work required by reviewing and discussing procedures for, but not limited to, following:
    - a. Tour field mockup and representative areas of required work, discuss and evaluate for compliance with required Contract Documents, including substrate conditions, surface preparation, sequence of procedures and other preparatory work performed by other installers and related trades.
    - b. Review Contract Document requirements.
    - c. Review approved submittals and field mockup.
    - d. Review procedures, including, but not limited to:
      - 1) Specified curing methods and procedures, in addition to disposal of concrete slurry and dust.
      - 2) Details for each step of grinding, polishing, and roughness average (Ra) recording operations.
      - 3) OSHA Silica regulation compliance.
      - 4) Application of liquid applied products, including colorants.
      - 5) Protecting concrete floor surfaces during construction and prior to polishing process begins.
      - 6) Protecting polished concrete floors after polishing work is completed.
  - 3. Reports: Record discussions, including decisions and agreements reached, and furnish copy of record to each party in attendance.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated and specified. Include mixing and application instructions for each product. Also include liquid chemical manufacturer's maintenance and cleaning instructions.
  - 1. Submit installer's recommended concrete topping mix design matching mockup installation for review prior to installation. Refer to Section 033000 "Cast-In-Place Concrete for requirements regarding concrete

topping slab.

- B. Shop drawings, clearly indicating layout of decorative saw cuts and colors, location of columns, doorways, enclosing walls/partitions and built-in cabinets. Show installation details at any special conditions.
- C. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of all joints, including construction joints.
- D. Samples for Initial Selection:
  - 1. Submit color samples for joint sealants and other treatments for contraction/control joints. Samples shall be in the form of actual samples, or may be in the form of sealant manufacturer's color charts. Color samples shall indicate full range of available colors.
- E. Samples for Verification: For each type of exposed color.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer/Applicator:
  - 1. Submit written letters from chemical manufacturer confirming that installer/applicator has been certified and/or trained by chemical manufacturer. Also submit in writing, evidence of at least seven (7) years' experience in grinding concrete, installing/applying hardeners/densifiers/sealers and polishing concrete similar in size to those areas required for this Project. Include a list of jobs completed in the states of Missouri, Colorado, Kansas, Texas, and contact information on Architect, General Contractor or Construction Manager, as applicable, and Owner. List each type of material used, detailed procedure for installation/application, quantity installed and dates completed.
    - a. Furnish certifications for polished concrete.
- B. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Liquid floor treatments.
  - 2. Floor finish system including; repair and patch materials, joint saw, clean and fill materials, liquid floor treatment and mechanical refinement.
- C. Field Quality Control: Submit certified test reports by an independent testing laboratory for the following:
  - 1. Dynamic Wet Coefficient of Friction (DCOF) in accordance with ANSI/NFSI B101.3.
  - 2. Finished Roughness Average (Ra) levels in accordance with ASME B46.1 measuring procedures.
- D. Minutes of pre-installation conference.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Requirements: For inclusion in Maintenance Manuals.
  - 1. Include manufacturer's instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use.

2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.
3. Include subcontractor's dynamic coefficient of friction (DCOF) and roughness average (Ra) plan to maintain high traction DCOF, vapor and stain barrier.

## 1.8 QUALITY ASSURANCE

A. Installer/Polisher Qualifications: Engage an Installer/Polisher, experienced in performing specified work similar in design, products and extent to scope of this Project; with a record of successful in-service performance.

Installer/polisher shall be certified and/or trained by liquid chemical manufacturer with experience in application and installation of systems similar to complexity to those required for this Project, plus the following.

1. Installer shall have a minimum of seven (7) years continuous experience under current company name; in grinding concrete, installing/applying water-based dyes/stains, installing/applying hardeners/densifiers/sealers, cutting compounds, and polishing concrete.
  2. Installer/polisher shall submit a reference list, complete with Owner, Architect, General Contractor or Construction Manager; phone number of each, and square footage installed of at least seven (7) completed projects in the states of Missouri, Colorado, Texas, and/or Kansas similar in size and specification.
  3. Installer/polisher shall have sufficient production capability, facilities and personnel to produce specified work.
  4. Installer/polisher shall assign experienced mechanics from previous applications, including lead mechanic/supervisor, for this Project.
    - a. Lead mechanic/supervisor shall be currently certified as a Craftsman by CPC.
    - b. Lead mechanic/supervisor shall be familiar with technical and practical instructions on achieving the performance similar to that specified with regard to the requirements in ASME B46.1, NFSI/ANSI B101.3, and NFSI Test Method 101-A.
    - c. Available installers shall include but not be limited to the following:
      - 1) Desco Floors, [www.descofloors.com](http://www.descofloors.com), (917) 608-7609  
(a) Contact: Brandon Godbey, [brandon@descofloors.com](mailto:brandon@descofloors.com)
      - 2) Chase Industrial Floors, (512) 903-7700.  
(a) Contact: James Bell, [cifloors@gmail.com](mailto:cifloors@gmail.com)
      - 3) Elegant Polishing (203) 430-3360.  
(a) Contact: [info@elegantpolishing.com](mailto:info@elegantpolishing.com)
      - 4) Wilhelm Construction, [www.fawilhelm.com](http://www.fawilhelm.com); (317) 937-8422.  
(a) Contact: Larry Arthur, [larryarthur@fawilhelm.com](mailto:larryarthur@fawilhelm.com)
      - 5) Meyer Najem, [www.meyer-najem.com](http://www.meyer-najem.com); (317) 577-0007.  
(a) Contact: Tim Russell, [trussell@meyer-najem.com](mailto:trussell@meyer-najem.com)
      - 6) XrQ Corp, [www.xrqcorp.com](http://www.xrqcorp.com); 408.898.0256  
(a) Contact: Timothy Kennady, [timothy.kennady@xrqcorp.com](mailto:timothy.kennady@xrqcorp.com)
      - 7) BCC, (503) 522-5319.
      - 8) Colorful Concrete Solutions, (262) 501-1972.
      - 9) DPR, (949) 554-4978.
      - 10) Floor Whisperer, (949) 300-6669.
      - 11) Pepper Construction, (740) 202-3455.
- B. Single Source Responsibility: Obtain each type of product from a single manufacturer and single source, to ensure system compatibility, color and sheen. Where system components are provided from separate

manufacturers, submit written statement from each product manufacturer certifying compatibility of system components.

1. Sealants may be from a separate manufacturer.
- C. Testing Agency: Test polished floors for dynamic coefficient of friction according to ANSI/NSFI B101.3.
1. Contractor shall review concrete polishing practices with polisher that will provide Surface Texture Grade (STG)/Roughness Average (Ra) values indicated. Contractor shall review these practices with the polisher at the preinstallation conference and at construction of the mockup for concrete floor polishing.
- D. Coefficient of Friction: Achieve the following dynamic coefficient of friction by field quality control testing in accordance with the following standards:
1. ANSI/NSFI B101.3 "Dynamic Coefficient of Friction"; achieve a minimum of 0.42 for level floor surface.
    - a. Resin matrix diamond tooling prohibited as DCOF levels can decrease through resin transfer.
    - b. "Silica stacking" prohibited as buildup of densifier on surface may reduce DCOF levels.
- E. Mock-Up: Before performing work of this Section, provide as many mockups required to verify selections made under submittals and to demonstrate aesthetic effects of coloring, grinding (aggregate exposure) and polishing for each type of finish. Apply surface finishes to concrete field samples in presence of Architect and Owner. Provide workmanship and procedures as required to meet Architect's and Owner's approval. Approval does not constitute approval of deviations from Contract Documents, unless such deviations are specifically brought to the attention of and accepted by Architect in writing.
1. Mockup Sample: Apply polished concrete floor finish to mockup area to demonstrate workmanship to be expected for the Work, including but not limited to: typical decorative saw cutting, treatment of control/contraction joints, slab preparation and repairs, cleaning, coloring, grinding, application of hardener/densifier, polishing for Surface Texture Grade (STG)/Roughness Average (Ra), and application of finish sealer if required to meet performance benchmarks. Mockup shall also include hand-grinding along one edge of each half of sample to simulate conditions adjacent to a vertical wall.
    - a. Mockups shall be demonstrated as directed by Architect.
    - b. Mockup shall be located in location to be determined by Architect and Owner.
    - c. Field sample criteria:
      - 1) Provide a separate field sample for each of the following conditions and finishes:
        - (a) Finishes
          - (1) CON1 - As indicated on Material Finish Legend.
        - (b) Conditions
          - (1) Polishing and grinding at existing structural concrete.
          - (2) Polishing and grinding at new structural concrete.
      - 2) Aggregate exposure to match Class B (Fine Aggregate Finish).
      - 3) Surface Texture Grade (STG)/ Roughness Average (Ra) shall be 16 µin (microinches) SemiGloss Finish, and as required to product the following results:
        - (a) Dynamic Coefficient of Friction: minimum of 0.42 for level floor surface per ANSI/NFSI B101.3.
        - (b) Polished Concrete Appearance: Level 3 – Polished Appearance.
    - d. Field samples shall be finished to desired uniformity of exposed aggregate, uniformity of color, uniformity of STG/Ra levels and treatment of joints. When approved, samples will serve as standard for the project.

- e. Project architect approved mockup shall remain accessible to Architect and Owner after installation concrete polishing is complete for comparison with the Work.
- f. Use same personnel, including supervisor/lead foreman, which will perform work.
- g. Roughness Average (Ra) readings shall be taken for each approved area and documented. Not less than 40 readings shall be taken for each approved finish and these values averaged. The average value shall be used as the basis for acceptability of finished areas for each color/finish.
- h. Mockup may remain in place as completed work provided it is undamaged.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original undamaged packages or acceptable bulk containers. All packaging and containers shall bear manufacturer's labels indicating brand name and directions for storage.
- B. Store packaged materials to protect them from elements or physical damage and from freezing.

#### 1.10 PROJECT CONDITIONS

- A. Concrete Damage and Stain Prevention: Contractor shall protect areas to receive decorative polished concrete floor finish at all times during construction to prevent damage and staining from; oils, dirt, metal rust, excessive water and other potentially damaging materials from effecting the finished concrete surface. Protection measures listed below shall begin as soon as possible after concrete is poured:
  - 1. Prohibit vehicle and scissor lift parking and driving over concrete surfaces to receive decorative concrete finish.
  - 2. Prohibit storage of any items over concrete surfaces to receive decorative floor finish for not less than 28 days after concrete placement.
  - 3. Protect from petroleum, oil, hydraulic fluids and other liquid dripping onto areas to receive the decorative concrete finish.
    - a. All hydraulic equipment shall be diapered to avoid concrete staining.
  - 4. Protect concrete slab areas to receive decorative floor finishing from contact with acids and acidic detergents.
  - 5. Avoid scissor lift and vehicle operation over curing polished floor finish according to manufacturer recommended instructions.
  - 6. Pipe cutting machines shall not be allowed on areas to receive the decorative concrete finish
  - 7. Steel shall not be placed/stored on the concrete slab to avoid rust stains.
  - 8. All painters shall use drop cloths in areas to receive decorative concrete floor finish. Any paint on the slab shall be removed immediately.
  - 9. All trades shall be informed that the concrete slab areas to receive colored concrete floor finish are to be protected at all times, prior to and after decorative concrete floor finishing operations.
- B. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting decorative polished concrete floor system application.

1. Place decorative polished concrete floor system only when ambient temperature and temperature of base slabs are between 50 and 100 deg F.
  2. Do not commence work until the building can be maintained at a minimum temperature of 50 deg F for 48 hours before, during, and 48 hours after application. Provide adequate controlled ventilation and bright, uniform lighting during application and inspections.
- C. Sequencing: Perform work of this Section after all wet work, such as painting has been completed in areas scheduled to receive decorative polished concrete floor finish.
1. Close areas to traffic during topping application and, after application, for time period recommended in writing by manufacturer.
- D. Surfaces must be acceptable in accordance with decorative concrete Contractor=s recommendations.
1. Notify Architect and Owner in writing of unsuitable surfaces and conditions. Commencement of work implies acceptance of surfaces and working conditions.

#### 1.11 WARRANTY

- A. Manufacturer's Warranty - Polished Finish: Provide 10 year manufacturer material warranty commencing at date of Substantial Completion. Manufacturer shall warrant to the Owner that the polished surface will remain water repellent, dustproof, hardened and abrasion and food/vapor stain resistant.

#### 1.12 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Concrete surfaces shall be protected by means recommended in writing by polishing product manufacturer.

### PART 2 PRODUCTS

#### 2.1 GENERAL

- A. General Properties: Finish shall be clear; water, wear, chemical, stain and oil resistant, non-slip and require limited maintenance. System shall be breathable.
1. Refer to Room Finish Schedule for polished concrete finish locations.
  2. Material Finish Legend designations:
    - a. Polished decorative concrete (033523.A01 – CONC1).
    - b. Sealed concrete (clean, prep & apply sealer) (033523.A02 – CONC2).
- B. Provide mechanical refinement methods for polished concrete floor systems. Requirements specific to dry polishing methods and wet polishing methods are indicated separately. Requirements indicated in this Section without a specific indication of the method used, shall apply to both methods.
1. Polished Concrete Floor System Properties: Finish shall be mechanically achieved with specified roughness average (Ra), clear appearance; meet or exceed ASTM C 309 and ASTM E 96 for stain resistance, provide minimum specified high traction DCOF in accordance with ANSI B101.3 and NFSI



recommendations, , and require maintenance plan for aesthetics and DCOF after initial installation. Topical sealers/guards not allowed in conjunction with refinement and polishing of concrete, but may be used as required to meet vapor/stain resistance requirements.

- C. Finish Requirements: Finish for polished concrete slabs shall match approved mockup sample for aggregate exposure class and surface texture grade (STG)/roughness average (Ra) level:
1. Aggregate Exposure: Match Class B (Fine Aggregate Finish).
  2. Surface Texture Grade (STG)/Roughness Average (Ra): 16 µin (microinches) burnish to semigloss finish.
    - a. Roughness Average (Ra) shall be as required to produce the following results:
      - 1) Dynamic Coefficient of Friction: minimum of 0.42 for level floor surface per ANSI/NFSI B101.3.
      - 2) Polished Concrete Appearance: Level 3 – Polished Appearance.
  3. Material Finish Legend designation: CON1.
  4. Refer to Room Finish and Material Color Schedules for polished concrete finish locations.

## 2.2 MATERIALS FOR WET POLISHING METHOD

- A. Basis of Specification Manufacturers: Reactive copolymerizing solids (RCS) architectural refined concrete floor finish system; densifier, diamond tooling, grinding apparatus, dust/slurry control equipment, concrete colorants, joint cleaning/cutting and filling, and protective commercial cover for polished floors. Deep penetrating concrete cutting compound and densification solutions specifically designed to harden and refine concrete. No sodium, potassium or lithium chemistry sealers/hardeners or densifiers may be used. Topical sealers and guards are prohibited. Architectural concrete floor will be resilient to stain without sacrificial coatings requiring reapplication. Subject to compliance with requirements provide complete architectural concrete finish systems from one of the following:
1. Element Five (E5), Specification Products, 888-881-1726, sales@specificationproducts.com
  2. BlendMax, Newtop Technologies, (512) 375-9915, info@newtoptechnologies.com
  3. Diamond Products Polishing, (309) 292 2438, anevener@diamondproducts.com
  4. The Juice, Sipco Global, (317) 606-9272, aanderson@sipcoglobal.com
  5. Comparable systems and products from other manufacturers will be considered, provided that they meet or exceed specified requirements, testing, and they are submitted to and approved by the Architect.
  6. Densifier/hardener products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers.
- B. Water: Potable, free from deleterious material that may affect color stability. Check that pH of local water will react well with Calcium Silicate Hydrate (C-S-H) production during densification.
- C. Patching Compound: Cement based compound compatible with traditional and reactive copolymerizing solids (RCS) technology types which when mixed with dust salvaged from grinding process, forms a paste that hardens

when surface imperfections are filled.

1. Imperfections include, but are not limited to: exposed air pockets, holes due to lost aggregate, etc.

## 2.3 MATERIALS FOR DRY POLISHING METHOD

- A. Basis of Specification Manufacturers: Subject to compliance with requirements provide liquid chemical products from the one of the following:
1. American Decorative Concrete Supply Company.
  2. Husqvarna.
  3. The Bomanite Company.
  4. Hi-Tech Systems.
  5. L&M Construction Chemicals, Inc.
  6. ProSoCo, Inc.
  7. Vexcon Chemicals, Inc.
  8. Comparable systems and products from other manufacturers will be considered, provided that they meet or exceed specified requirements and they are submitted to and approved by the Architect.
- B. Spall/Crack Repair/Patching Compound: Compound composed of 40 percent portland cement, 45 percent limestone, and 15 percent vinyl acetate copolymer, when mixed with dust salvaged from grinding process, forms a paste that hardens when surface imperfections are filled.
1. Imperfections include, but are not limited to: exposed air pockets, holes due to lost aggregate, etc.
  2. Manufacturers and Products:
    - a. Basis of Design: HiTech Systems "Spall-FX". (615) 756.8008
    - b. Comparable products from other manufacturers will be considered when submitted to and approved by the Architect prior to bidding.
- C. Vapor and Stain Resistant Sealer- Food, Vapor, and Chemical Resistant Sealer: Provide a non-film forming; sealer designed to be used on concrete surfaces previously hardened and densified that do not reduce DCOF. Sealer shall have a VOC content of not greater than 40 g/L and meet benchmarks described in ASTM C309 and ASTM E96.
1. Manufacturers and Products:
    - a. Basis of Design: Bomanite "Vitrafinish" for general use. At restrooms Husqvarna, "Hiperseal"
    - b. Vexcon Chemicals, Inc.; "Certi-Shine Fixative".
    - c. Ameripolish; "SR2 WB Stain Resistor".
    - d. Comparable products from other manufacturers will be considered when submitted to and approved by the Architect prior to bidding.

## 2.4 MATERIALS FOR WET POLISHING METHOD AND DRY POLISHING METHOD

- A. Liquid Hardener/Densifier: Provide an odorless, non-hazardous, penetrating type silicate, reactive copolymerizing solids, or silicate designed to react with free lime and calcium hydroxide in concrete to produce permanent chemical reaction that hardens and densifies concrete surface. Penetrating hardener/densifier shall

be compatible with applied sealers, where are required to meet required performance benchmarks. Sealers shall not be of type that triggers nor contributes to surface alkali silicate reaction. Penetrating sealer shall have a VOC content of not greater than 40 g/L. Sodium densifiers not allowed. Densifiers containing coatings or sealer material such as epoxy, acrylic or latex not allowed. No exceptions. Micro void filler epoxy, latex or acrylic "pit grout" coatings shall be prohibited as they do not create calcium silicate hydrate (C-S-H) and artificially influence mechanical refinement of floor. No exceptions. If sealers, coatings are used to mimic refinement portion of polishing process floor will be corrected at no expense to the owner.

1. Manufacturers and Products:
  - a. Basis of Design: Blendmax RCS.
  - b. Vexcon Chemicals, Inc.; "Certi-Shine Clear".
  - c. Scofield; Formula One.
  - d. Comparable products from other manufacturers will be considered when submitted to and approved by the Architect prior to bidding.
- B. Water: Potable, free from deleterious material that may affect color stability. Check that pH of local water will react well with Calcium Silicate Hydrate (C-S-H) production during densification.
- C. Joint Sealants: Semi-rigid 2-part polyurea type.
  1. Shore A Hardness: 70 to 80 when tested in accordance with ASTM D 2240.
  2. Tensile strength: Not less than 1160 pounds per square inch when tested in accordance with ASTM D 412.
  3. Products: Subject to compliance with requirements, provide one of the following:
    - a. Adhesives Technologies Corp.; Crackbond JF311.
    - b. Hi Tech Systems; Joint Fill.
    - c. Curecrete Distribution Company, Inc.: Ashford Crete-Fill.
    - d. L&M Construction Chemicals, Inc.: Joint Tite 750.
    - e. NewTop Technologies; Clean and Fill 50.
    - f. VersaFlex Incorporated; SL/75 Joint Filler.
    - g. Comparable products from other manufacturers will be considered when submitted to and accepted by Architect prior to bidding.
- D. Temporary Floor Protection System: Subject to compliance with requirements provide "Ram Board" by Ram Board or a comparable product submitted to and accepted by Architect prior to bidding with the following product characteristics.
  1. Description: Fiber-reinforced protection board designed to allow new concrete to cure while absorbing impacts
  2. Material Thickness: 46 mils
  3. Wall Guard Feature: Board shall be designed by manufacturer to fold for protection of adjacent walls up to 8 inches above finished floor.
  4. Floor protection systems requiring application of a liquid base coat shall be prohibited.
  5. Provide manufacturer's recommended seaming tape, vapor curing tape, and edge tape at locations recommended in writing by manufacturer.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Installer shall examine subfloor surfaces with Owner and Architect present to verify all substrates and conditions are satisfactory. A satisfactory subfloor surface is defined as one that is smooth and free from stains, cracks, holes, ridges, curing compounds and other coatings/contaminants which could interfere with application of decorative polished concrete floor system, and other defects impairing performance or appearance.
- B. Do not proceed with work of this Section until concrete slab surfaces are satisfactory. Commencement of decorative polished concrete flooring work is construed as applicator's acceptance of surfaces within particular area.

### 3.2 PREPARATION

- A. General: Comply with liquid chemical manufacturer's written instructions and recommendations for preparation of substrate in addition to the following:
  - 1. Remove hardware, hardware accessories, plates, machined surfaces, and similar items which are not to be colored; or provide surface-applied protection prior to surface preparation and coating. Remove these items if necessary for complete coating of the items and adjacent surfaces. Following completion of coating operations in each space or area, reinstall items removed, using workmen skilled in the trades involved.
  - 2. Clean surfaces before applying decorative polished concrete finish system. Schedule cleaning and coating application so dust and other contaminants will not fall on wet, newly coated surfaces.
  - 3. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of floor finishing chemicals. Cover adjoining and nearby surfaces of aluminum, glass, drywall, etc. where there is the possibility of the chemicals being deposited on surfaces. Immediately clean chemicals from adjoining surfaces, complying with manufacturer's cleaning recommendations.
    - a. Prevent spillage and runs of chemicals onto adjacent surfaced to best extent possible.
    - b. Protect adjacent materials and finishes from physical damage during finishing operations.
    - c. Provide protections as required and remove from site at completion of work.
- B. Moisture and Alkalinity Testing
  - 1. Perform moisture, and alkalinity tests on concrete slabs indicated to receive decorative floor finish to determine if surfaces are sufficiently cured and dry as well as to ascertain presence of curing compounds.
  - 2. No more than seven days prior to the scheduled installation, test the slab for moisture and alkalinity. Submit to the Architect and Owner a written report on the moisture and alkaline condition of the slab. Submit test findings to Architect.
    - a. Test the concrete using a calcium chloride crystal test kit or perform relative humidity testing in accordance with ASTM F 2170 when recommended by liquid hardener/densifier manufacturer to suit conditions existing at the site in areas to receive decorative concrete floor finish.
    - b. Test the concrete for surface alkaline using pH test paper in accordance with ASTM F 710.

3. Perform testing and document results for not less than every 1000 sq ft of floor area. Perform tests where resilient surfacing is to be installed. The concrete slab must have a minimum 28 days for proper curing to reach acceptable dryness prior to testing. Conduct tests after space has been maintained at a temperature of 50 deg F or higher for not less than 48 hours and relative humidity ranges from 30 to 50 percent.
  4. Acceptable Results:
    - a. Optimum emissions rate as acceptable to manufacturer for polishing system.
    - b. Optimum relative humidity level; as acceptable to manufacturer for polishing system.
    - c. Optimum alkalinity; pH between 8 and 10.
  5. Do not proceed with flooring work until subfloor surfaces are satisfactory. Start of decorative concrete floor finish work is construed as applicator's acceptance of surfaces within particular area.
- C. Surface Preparation: Perform surface preparation and cleaning in compliance with the decorative polished concrete floor system (liquid chemical) manufacturer's written instructions for particular substrate conditions, and as specified.
1. Initial Preparatory Cleaning: Clean surfaces of concrete to receive decorative polished concrete floor system by removing stains, efflorescence, chalk, dust, dirt, release agents, grease and oils. Treat oil spots with oil emulsifier and oil absorber materials as recommended by chemical manufacturer.
  2. Initial Grinding: As recommended by polished concrete floor finish (chemical) manufacturer, mechanically sand/grind cured concrete surfaces to achieve levels used on approved field samples. Grinding shall also be done to level the slab as much as possible without exposing aggregate. Grinding machine shall have an integral dust extraction system.
  3. Final Preparatory Cleaning: Clean surfaces of concrete to receive colored concrete floor system by removing dust, dirt, and other debris left from saw cutting and grinding/sanding procedures.

### 3.3 POLISHING METHOD – GENERAL APPLICATION

- A. General: Begin application of decorative polished floor finish as determined by application on approved field samples to achieve matching aggregate exposures, and sheen levels.
1. Surface Continuity: Perform finishing in as continuous an operation as possible, utilizing same work crew to maintain continuity of finish on each surface or area of work.
- B. Material Preparation: Carefully mix and prepare materials in compliance with the liquid chemical manufacturer's written instructions.
- C. Hardener/Densifier Application: Apply hardener/densifier/sealer in strict accordance with sealer manufacturer's written instructions, to match application and finish on approved field samples.
- D. Mechanical Polishing: Polish concrete in strict accordance with polishing system manufacturer's written instructions, to match application and finish on approved field samples.

E. Joint Sealing: In strict accordance with floor finish system manufacturer's written instructions clean and fill control joints to match application and finish on approved field samples. Use joint filler and debris removal blade system, designed specifically for this purpose.

1. Do not fill moving isolation joints or expansion joints.

F. Buffing/Burnishing: Burnish in strict accordance with floor finish system manufacturer's written instructions, to match application and finish on approved field samples.

### 3.4 POLISHING FOR CONCRETE FLOORS – WET AND DRY METHODS

A. General: Begin application of decorative polished floor finish as determined by application on approved field mockup samples to achieve matching aggregate exposure and surface texture grade (STG)/roughness average (Ra) levels.

1. Surface Continuity: Perform finishing in as continuous an operation as possible, utilizing same work crew to maintain continuity of finish on each surface or area of work.
2. Use hand equipment against walls for work of this Section as necessary to maintain uniformity of aggregate exposure and STG/Ra finish.
3. Protection of Work Below Polishing Elevated Slabs: Protect finished and unfinished floor and wall surfaces below elevated slabs during concrete polishing. Residue from polishing operations shall be removed immediately from surfaces below elevated slabs.

B. Sequence of Polishing: Perform polishing after partitions studs are erected, but before gypsum board is installed.

C. Initial Grinding:

1. Prior to grinding, clean floor then fill control joints with semirigid joint sealant.
2. Take and record initial Ra reading for Owner floor maintenance log.
3. Begin refinement with appropriate tooling based on initial average roughness (Ra) measurements.
4. Make sequential passes to achieve next step of refinement.
5. Fill surface imperfections including, but not limited to, holes, surface damage, small and micro-cracks, air holes, pop-outs, and voids with original concrete matrix material from grinding so that filled areas can create calcium silicate hydrate (C-S-H) and match color and quality of concrete field.
  - a. Coating products such as epoxy grout, acrylic grout, or latex grout are non-cementitious and are prohibited.
6. Achieve and record maximum refinement with each pass before proceeding to next average roughness (Ra) level and diamond tool pass.
7. Clean floor using squeegee vacuum attachment or dust filtration system according to manufacturer instructions.
8. Continue grinding until aggregate exposure matches approved field mockup sample.

D. Liquid Hardener/Densifier Application:

1. Apply undiluted in strict accordance with liquid chemical manufacturer's written instructions, to match application and finish on approved field samples. Remove excess liquid to avoid silica stacking and potentially lowering DCOF, and allow to cure according to manufacturer's instructions.

E. Refining and Polishing:

1. Mechanically refine and polish with liquid hardening agent to achieve specified Ra.
2. Record STG/Ra average number in log.
3. Using burnishing equipment and appropriate Ra level burnishing pads, burnish to finish meeting performance benchmarks of DCOF and stain resistance to match accepted mock-up sample. Compare to mockup sample.
4. Do not use epoxy matrix diamond tooling which might transfer resin to floor surface and reduce DCOF and create epoxy film coating.
5. Joint Sealing: After final polishing, cut out and replace semirigid joint sealant damaged during grinding process. Intent is to have joint sealant as continuous as possible.

F. Final Polished Concrete Floor Finish Properties:

1. Aggregate Exposure:
  - a. As indicated under sub-section 2.1.B Finish Requirements.
2. Finished Surface Texture Grade (STG)/Roughness Average (Ra) Levels:
  - a. As indicated under sub-section 2.1.B Finish Requirements.

G. Sealer and Coating Installation

1. Roughness Average (Ra) measurements shall be taken prior to application of sealers, guards, or coatings.
2. Install protective sealer according to manufacturer's instructions to meet vapor/stain resistance benchmarks.
3. Roughness Average (RA) deviation is allowable up to 5% after sealer installation. No deviation shall be permitted on DCOF performance requirements.

H. Temporary Floor Protection System:

1. Cover polished concrete floors with temporary floor protection system after completion of polished concrete floor finish.
2. Temporary floor protection system shall be maintained in good condition as recommended by manufacturer until construction activities are complete.

### 3.5 FIELD QUALITY CONTROL

- A. Field Testing: Engage a qualified testing agency to perform field testing according to ANSI/NFSI 101.3 to determine if polished concrete floor finish complies with specified dynamic coefficient of friction.

1. Performance Criteria: Decorative polished concrete floor finish shall achieve not less than 0.42 for level floor surfaces.

### 3.6 CLOSEOUT ACTIVITIES

- A. Maintenance Training: Authorized representative of concrete polishing materials manufacturer shall train Owner's designated personnel in proper procedures for maintaining polished concrete floor.
- B. Contractor shall hand in and review Roughness Average (Ra) documentation for DCOF maintenance, as well as cleaning maintenance with owner's facility maintenance representative responsible for facility floor maintenance. Train Owner's representative on proper maintenance of new floor finish.

### 3.7 CLEANUP AND PROTECTION

- A. Clean-Up: At the end of each work day, remove rubbish, empty cans, rags and other discarded materials from site.
  1. Upon completion of work, clean up spattered surfaces. Remove spattered coatings by washing, scraping or other proper methods. Do not scratch or damage adjacent finished surfaces.
- B. Cure decorative polished concrete floor finish, in compliance with chemical manufacturer's directions, to prevent their contamination, staining and damage.
- C. Clean decorative polished concrete floors just prior to substantial completion. Use materials and procedures recommended by chemical manufacturer.
- D. Protect decorative polished concrete floor finish from damage and staining during construction operations. Where temporary covering is required for this purpose, comply with chemical manufacturer's recommendations for protective materials and method of their application. Remove temporary covering just prior to cleaning and final inspection.

END OF SECTION 033523



## **SECTION 042000 - UNIT MASONRY**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

##### **A. Section Includes:**

1. Concrete masonry units (042000.A01)
2. Clay face brick (042000.A12)
3. Lintels and Bond Beams
  - a. U-Shaped Masonry Lintels (042000.A10)
  - b. U-Shaped Masonry Bond Beams (042000.A11)
4. Mortar (042000.A19) and Grout (042000.A22).
5. Reinforcement
  - a. Steel reinforcing bars (042000.A23).
  - b. Masonry-joint reinforcement (042000.A24).
  - c. Ties and anchors.
  - d. Adjustable Masonry Veneer Anchors (042000.A26)
  - e. Rigid Anchors (042000.A27)
6. Masonry flashing materials:
  - a. Drip Edge (042000.A31)
  - b. Embedded flexible through-wall flashing (042000.A32).
  - c. Termination Bars (042000.A34).
  - d. Isolation strip flashing (042000.A42).
7. Miscellaneous masonry accessories.
  - a. Compressible filler (042000.A35).
  - b. Tubular compressible filler (042000.A36).
  - c. Weep Vents (042000.A39).
  - d. Cavity drainage material (042000.A40).
  - e. Cavity wall insulation (042000.A45).
  - f. CMU control joint (042000.A46).

##### **B. Products Installed but not Furnished under This Section:**

1. Loose steel lintels in unit masonry.
2. Steel shelf angles for supporting unit masonry.

##### **C. Related Requirements:**

1. Section 012300 "Alternates" for alternates effecting work of this Section.
2. Section 014000 "Quality Requirements" for independent testing agency procedures and administrative requirements.
3. Section 044319 "Adhered Thin Masonry Veneer" for adhered thin brick applications.
4. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
5. Section 055000 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
6. Section 072729 "Fluid-Applied Air Barrier Membrane Coating" for air barrier and transition membrane.

7. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

## 1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

## 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  1. Before installation of unit masonry, review procedures and tolerances for ensuring quality of masonry materials. Require representatives of each entity directly concerned with unit masonry to attend, including but not limited to the following:
    - a. Owner's representative
    - b. Architect and Engineer.
    - c. Contractor's superintendent.
    - d. Masonry subcontractor.
    - e. Manufacturer's representative for masonry units.
    - f. Manufacturer's representative for flashing components.
  2. Review field quality control measures for the following items:
    - a. Field dimensions and tolerances for unit masonry installation.
    - b. Installation procedures for flashing components.
    - c. Review of shop drawing elevations indicating colors of unit masonry and locations.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  1. Submit product data for cavity wall insulation concurrently with product data for cavity wall insulation air barrier coatings.
- B. Shop Drawings: For the following:
  1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
  2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
  3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection:
  1. Clay face brick, in the form of straps of five or more bricks.
  2. Colored mortar.
  3. Weep holes and cavity vents.
- D. Samples for Verification: For each type and color of the following:
  1. Clay face brick, in the form of straps of five or more bricks.
  2. Special shapes for the following:
    - a. Clay face brick.

- b. Concrete masonry units.
3. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
4. Weep holes and cavity vents.
5. Accessories embedded in masonry.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
  1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
  1. Masonry units.
    - a. Include material test reports substantiating compliance with requirements.
    - b. For exposed brick, include test report for efflorescence according to ASTM C 67, including testing for Initial Rate of Absorption (IRA).
    - c. For concrete masonry units, include data and calculations establishing average net-area compressive strength of units.
    - d. For concrete masonry units included within fire resistant construction, provide certificate from manufacturer indicating compliance with ACI 216.1, latest edition for production of fire rated concrete masonry products.
  2. Cementitious materials. Include name of manufacturer, brand name, and type.
  3. Mortar admixtures.
  4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
  5. Grout mixes. Include description of type and proportions of ingredients.
  6. Reinforcing bars.
  7. Joint reinforcement.
  8. Anchors, ties, and metal accessories.
  9. Flexible flashing: Include independent testing to verify the 8 mil and 32 mil requirements.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
  1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.

2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
- F. Grout Procedures: Detailed description of methods, materials, and equipment to be used to comply with grouting requirements.
- G. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

#### 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Mockups for Exterior Walls: Build mockups to verify selections made under sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  1. Build mockups for typical exterior wall areas indicated on Drawings. Mockup shall be built to dimensions as indicated on Drawings and shall include the following features.
    - a. Some areas shall utilize masonry block backup. Some areas shall utilize stud backup. Refer to Drawings for sizes and locations.
    - b. In approximately the center of each leg of mockup shall be a 3/8 inch wide sealant-filled control joint. All backup substrates shall receive fluid-applied air barrier coating.
    - c. Include through-wall flashing installed for full length of all legs of mockup.
    - d. Include cavity insulation, veneer anchors, flashing, cavity drainage material, and weep holes and rope weeps (as applicable) in exterior masonry-veneer wall mockup.
  2. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
  3. Protect accepted mockups from the elements with weather-resistant membrane.
  4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
    - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
  5. Demolish and legally dispose of mockup after date established for Substantial Completion.
  6. Mockup shall be tested under AAMA 501.2 (Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.)

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

- B. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.8 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
  - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each

product required.

- B. Source Limitations for Face Brick: Obtain exposed face brick of a uniform texture, color and size, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
  - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

## 2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated as determined by testing according to ASTM E119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.
  - 1. Where fire-resistance-rated construction is indicated, units shall be listed by a qualified testing agency acceptable to authorities having jurisdiction. Documentation of listing and sourcing shall be provided by manufacturer to Owner and Architect.

## 2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
  - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  - 2. Provide bullnose units for outside corners unless otherwise indicated.
    - a. At areas indicated to receive tile as the finish surface use a non-bullnose unit at outside corners.
  - 3. Provide double bullnose units for tops of walls as indicated.
- B. CMUs (042000.A01): ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3750 psi.
2. Density Classification: Lightweight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Fire Resistance: Concrete masonry units within fire rated wall construction shall be produced in accordance with ACI 216.1, latest edition.

## 2.5 MASONRY LINTELS AND BOND BEAMS

- A. U-Shaped Masonry Lintels (042000.A10): Prefabricated (site cast) or built-in-place masonry lintels made from U-shaped lintel bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.
- B. U-Shaped Masonry Bond Beams (042000.A11): Prefabricated (site cast) or built-in-place masonry bond beams made from U-shaped bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout.

## 2.6 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
  1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
  2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
  3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
  4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Face Brick (042000.A12): Facing brick complying with ASTM C 216.
  1. Grade: SW.
  2. Type: FBX.
  3. Unit Compressive Strength: Provide units with minimum average net-area compressive strength as follows:
    - a. Type UM1: 4500 psi.
    - b. Type UM2: 5000 psi.
  4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C 67.
  5. Saturation Coefficient: Ranging between 0.55 to 0.70 when tested according to ASTM C 67.

6. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
7. Size (Actual Dimensions):
  - a. Type UM1 and UM2 - Modular: 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
8. Application: Use where brick is exposed unless otherwise indicated.
9. Color and Texture: Match Architect's samples.
  - a. Type UM1: Bowerstone Shale Company; Special Blend.
  - b. Type UM2: Bowerstone Shale Company; Special Blend.

## 2.7 MORTAR (042000.A19) AND GROUT (042000.A22) MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction.  
Provide natural color or white cement as required to produce mortar color indicated.
  1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Davis Colors; True Tone Mortar Colors.
    - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
    - c. Solomon Colors, Inc.; SGS Mortar Colors.
  2. Color:
    - a. As selected by Architect from manufacturer's full range of available colors.
  3. Location: Refer to Mortar and Grout Mixes in Part 3 of this Section.
- E. Aggregate for Mortar: ASTM C 144.
  1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
  2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- F. Aggregate for Grout: ASTM C 404.
- G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- H. Water: Potable.

## 2.8 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars (042000.A23): ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.



- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General (042000.A24): ASTM A 951/A 951M.
  - 1. Interior Walls: Hot-dip galvanized carbon steel, Class B-2.
  - 2. Exterior Walls: Hot-dip galvanized carbon steel, Class B-2.
  - 3. Wire Size for Side Rods: 0.148-inch diameter.
  - 4. Wire Size for Cross Rods: 0.148-inch diameter.
  - 5. Wire Size for Veneer Ties: 0.148-inch diameter.
  - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
  - 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.
- E. Masonry-Joint Reinforcement for Multiwythe Masonry:
  - 1. Adjustable (two-piece) type, ladder design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
    - a. At Contractor's option, masonry joint reinforcement for single-wythe masonry may be used in backup wythe in conjunction with individual adjustable masonry veneer anchors for exterior wythe.

## 2.9 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
  - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
  - 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
  - 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
  - 1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel wire.
  - 2. Tie Section: Triangular-shaped wire tie made from 0.25-inch- diameter, hot-dip galvanized steel wire, Class B-2.

- D. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Use adjustable masonry veneer anchors specified later in this Section.
- E. Partition Top Anchors: 0.105-inch-thick metal plate with a 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- G. Adjustable Masonry-Veneer Anchors (042000.A26):
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to metal studs, and as follows:
    - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
  2. Provide anchors designed for attachment over sheathing to metal studs and other substrates indicated.
  3. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch-thick steel sheet, galvanized after fabrication.
  4. Wire Ties: Fabricate ties from 0.187-inch- diameter, hot-dip galvanized-steel wire unless otherwise indicated.
    - a. Wire ties shall be triangular-, or rectangular-shaped.
  5. Masonry-Veneer Anchors - Contractor's Option: Unless otherwise indicated, provide one of the adjustable masonry-veneer anchors specified.
    - a. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie, a metal anchor section and insulation support plate. Provide one of the following anchor sections for masonry backup and metal stud with sheathing:
      - 1) Provide "CTP-16" adjustable masonry veneer anchors with insulation support plate as manufactured by Construction Tie Products, Inc.
      - 2) Provide "Slotted Rap-Tie" masonry veneer anchors with insulation support plate as manufactured by FERRO Corporation.
    - b. Fabricate sheet metal anchors sections and other sheet metal parts from 0.075 inch thick, steel sheet, galvanized after fabrication.
  6. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours according to ASTM B 117.
  7. Steel Tapping Screws for Concrete and Masonry: Self-tapping screws tapcon with specially designed threads for tapping and wedging into masonry, with hex washer head and neoprene washer, 3/16" diameter by 1-1/2" length, and with the following corrosion-protective coating:

- a. Organic polymer coating with salt-spray resistance to red rust of more than 500 hours per ASTM B 117.

## 2.10 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.
- B. Anchor Bolts: L-shaped steel bolts complying with ASTM A307, Grade A (ASTM 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and , where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.
- C. Postinstalled Anchors: Torque-controlled expansion anchors or chemical anchors.
  1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
  2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5 unless otherwise indicated.
  3. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F738M) and nuts, ASTM F594 (ASTM F836M).
- D. Stainless Steel Dowels: ASTM A 276 or ASTM A666, Type 304, ½ inch diameter and not less than 5 inches long to provide at least 2 inch embedment in to adjoining units/substrates.

## 2.11 EMBEDDED FLASHING MATERIALS

- A. Flexible Flashing (042000.A32):
  1. Basis-of-Design Product: Subject to compliance with requirements, provide one of the products listed below or comparable product from other manufacturers, meeting specified requirements, submitted to and accepted by Architect prior to bidding.
    - a. Composite Sheet: Flashing shall be 40 mils in nominal thickness, consisting of 32 mil self-adhering rubberized asphalt membrane laminated to an 8 mil, cross-laminated and high-density polyethylene film.
      - 1) Acceptable Manufacturers and Products:
        - (a) Carlisle Coatings and Waterproofing; CCW-705-TWF.
        - (b) Henry; Blueskin TWF.
        - (c) Firestone Building Products; Enverge Flashgard.
      - 2) Fire Propagation Characteristics: Flexible strip flashing is used in exterior walls
      - 3) Flexible flashing shall pass NFPA 285 testing as part of an approved assembly. Flashing shall be compatible with air barrier coating specified in Section 072729.
    - b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- B. Application: Unless otherwise indicated, use the following:
  1. For through-wall flashing, use flexible flashing to exterior face of exterior wythe, adhere flexible flashing to top of metal drip edge. Adhere stainless steel drip edges to masonry, steel lintels and adjacent construction beneath drip edge as occurs.
- C. Accessories for Flexible Flashing:

1. Drip Edges (042000.A31): Provide stainless steel drip edges fabricated from ASTM A 240/A 240M, Type 304, not less than 0.016 inch thick. Fabricate drip edges with a 2-1/2 inch minimum flange and a 3/8 inch drip. All exposed corners shall be welded and the edge rounded. Mitering of outside corners will not be accepted.
    - a. Termination Drip Edges at Steel Lintels and Shelf Angles: Provide stainless steel drip edges fabricated to configuration indicated from ASTM A 240/A 240M, Type 304, not less than 0.016 inch thick. Stainless steel flashing shall be preformed to wrap around exposed portion of steel lintels and shelf angles and provide a drip edge.
  2. Termination Bars (042000.A34): Provide stainless steel or aluminum bars; 1/8" thick with a 1" face and ¼ inch minimum bent top (lip) to receive sealant and 8'-0" to 10'-0" length. Bars shall be predrilled at 8" centers starting 4" in from each end.
    - a. Termination bars shall be similar to Wire-Bond, Model 2410.
  3. Adhesives: Provide adhesives as recommended by flexible flashing manufacturer for adhering flexible flashing to drip edge and adhering drip edge to supporting substrate.
- D. Solder and Sealants for Sheet Metal Flashings:
1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
  2. Elastomeric Sealant: ASTM C 920, chemically curing urethane or polysulfide sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.
- E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

## 2.12 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler (042000.A35): Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.
  1. Basis of Design Product: W.R. Meadows; "Ceramar".
- B. Tubular Compressible Fillers (042000.A36): Pre-molded, neoprene, butyl, EPDM or silicone tubing complying with ASTM D1056, non-absorbent to water and gas, capable of remaining resilient at temperatures down to 26 deg. F. Provide products with low compression set and of shapes and sizes as follows:
  1. Outside diameter shall be ¼ inch greater than air cavity between face brick and backup construction.
  2. Basis of Design Product: Subject to compliance with requirements, provide "Insul-Tube" by Namoco K-Flex.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).
- D. Weep/Cavity Vent Products: Use[ one of] the following unless otherwise indicated:
  1. Mesh Weep/Vent (042000.A39): Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.

- a. Products: Subject to compliance with requirements, provide the following:
    - 1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.
  - b. Size: Weep shall be sized for full vertical dimension of masonry units indicated.
- E. Cavity Drainage Material (042000.A40): Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

- 1. Products: Subject to compliance with requirements, provide the following:
  - a. Mortar Net USA, Ltd.; "Wall Defender".
  - b. Comparable products from other manufactures submitted to and accepted by Architect prior to bidding will be considered.
- 2. Configuration: Provide one of the following:
  - a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.
  - b. Thickness: Provide 2 inches and 1-1/2 inches as indicated on Drawings.

- F. Isolation Strip Flashing (042000.A42): Provide self-adhering, polyethylene-sheet backed rubberized asphalt membrane, 40 mils thick.

- 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work included, but are not limited to, the following:
  - a. Air-Shield by W. R. Meadows, Inc.
  - b. Blueskin by Henry Corp.
  - c. CCW 705 by Carlisle Coatings & Waterproofing.
  - d. Hyload S/A Through Wall Flashing by Hyload, Inc.

#### 2.13 CAVITY-WALL INSULATION (042000.A45)

- A. Polyisocyanurate Board Insulation: Refer to Section 072100 for requirements.
- 1. Provide behind steel lintels prior to installation of through-wall flashing and at other locations where indicated. Shape to configurations shown.

#### 2.14 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned. Do not use acidic cleaners on manufactured stone masonry.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Diedrich Technologies, Inc.
    - b. EaCo Chem, Inc.
    - c. ProSoCo, Inc.

#### 2.15 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
- 1. Do not use calcium chloride in mortar or grout.
  - 2. Use portland cement-lime mortar unless otherwise indicated.

3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
1. For masonry below grade or in contact with earth, use Type S.
  2. For reinforced masonry, use Type N.
  3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls, use Type N
  4. For interior load-bearing walls; for interior nonload-bearing partitions, use Type N.
  5. For other applications where another type is not indicated, use Type N.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products].
1. Pigments shall not exceed 10 percent of portland cement by weight.
  2. Mix to match Architect's sample.
  3. Application: Use pigmented mortar for exposed mortar joints with the following units:
    - a. Clay face brick.
- E. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
  2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 3000 psi.
  3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

## 2.16 MATERIALS FOR CLEANING OF EXISTING MASONRY

- A. General: Cleaning methods are to be tested on field sample mockup areas and are to progress from least harsh (bucket and brush) method to more harsh (chemical cleaning) methods.
- B. Water for Cleaning: Clean, potable, free of oils, acids, alkalis, salts, and organic matter.
- C. Warm Water: Heat water to temperature of 140 deg F-180 deg F (60 deg C-82 deg C).
- D. Brushes: Fiber bristle only.
- E. Brick Cleaner: Manufacturer's alkaline masonry cleaner.
1. Product: Subject to compliance with requirements, provide one of the following:
    - a. Enviro Klean "ReKlaim" cleaner and Sure Klean "Limestone and Masonry Afterwash", both as manufactured by ProSoCo, Inc.
    - b. Diedrich Chemicals; comparable product.

- F. Protective Film: For windows, glass, metal and polished stone surfaces during acidic and alkaline masonry cleaning, use self-adhesive, translucent polyethylene protective film.
  - 1. Products: 3M Long-mask Masking Tape #2090 and the self-adhesive, thin, window protection film by 3M, 3M Protective Tape 2A26B. Catalog No. RM2090, 24" or 35" side.
- G. Spray Equipment: Provide equipment for controlled spray application of water and chemical cleaners, if any, at rates indicated for pressure, measured at spray tip, and for volume.
  - 1. For spray application of chemical cleaners provide low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray-tip.
  - 2. For spray application of water provide fan-shaped spray-tip which disperses water at angle of not less than 45 degrees.
- H. Chemical Cleaning Solutions:
  - 1. When recommended by chemical cleaner manufacturer, dilute chemical cleaning materials with water to produce solutions of concentration indicated but not greater than that recommended by chemical cleaner manufacturer.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
  - 2. Verify that foundations are within tolerances specified.
  - 3. Verify that reinforcing dowels are properly placed.
  - 4. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build singlewythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.
- G. Coordination with Spray-Applied Membrane Air Barrier Coating: Adjustable veneer anchors shall be installed after to application of air barrier.
- H. Fluid Applied Air Barrier Requirements: This project will have fluid-applied Air Barrier material applied to the cavity side of the CMU. Special attention and care must be taken to provide a smooth, filled surface to receive the membrane. The care is necessary to insure the design performance of the selected materials. Concrete masonry unit (CMU) wall shall be prepared as follows to accept the air & vapor barrier:
  - 1. Surfaces shall be free of contaminants such as grease, oil and wax on surfaces to receive membrane.
  - 2. CMU surfaces shall be free from projections.
  - 3. Strike all mortar joints flush to the face of the concrete block.
  - 4. Fill all voids and holes greater than ¼ inch across at any point with mortar, sealant or other approved fill material.
  - 5. Surface irregularities exceeding ¼ inch in height or sharp to touch shall be ground flush or made smooth.
  - 6. Fill around all penetrations with mortar, sealant or other approved fill material and strike flush.
  - 7. Remove mortar droppings on brick ties, shelf angles, brick shelves or other horizontal obstructions.

### 3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
  - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
  - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
  - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
  - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
  - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.



3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

### 3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
  1. Refer to Exterior Elevations and Exterior Material Finish Legend for bond pattern.
  2. Face Brick - Bond pattern shall be 1/2-running bond pattern.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units

and mortar, and wet brick if required before laying fresh masonry.

- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
  - 1. Fill cores in exterior masonry veneer and hollow CMUs with grout or mortar under through-wall flashing.
  - 2. Fill base of wall between exterior masonry veneer and CMUs (collar joint) with grout as indicated and apply mortar across top if insulation and grout to form a mortar wash directly beneath horizontal leg of through-wall flashing.
- I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
  - 1. Install compressible filler in joint between top of partition and underside of structure above.
  - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
  - 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

### 3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and CMUs as follows:
  - 1. Fully bed face shells in mortar and make head joints of depth equal to bed joints.
  - 2. Fully bed webs in mortar in all courses of piers, columns, and pilasters.
  - 3. Fully bed webs in mortar in grouted masonry, including starting course on footings.
  - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
  - 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

- D. Cut joints flush where indicated to receive the following finishes unless otherwise indicated.
  - 1. Waterproofing
  - 2. Cavity wall insulation
  - 3. Fluid applied air barriers
  - 4. Other direct-applied finishes (other than paint).

### 3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
  - 1. Where air/moisture barrier is integral with exterior wall sheathing, use adjustable-type (two-piece-type) ties.
  - 2. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.0 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically.  
  
Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
    - a. Use adjustable-type (two-piece-type) ties.
    - b. At base of wall, within 12 inches of horizontal leg of through-wall flashing, provide adjustable veneer anchors. Install in joint indicated and space at 32 inches o.c.
    - c. Install additional anchors within 12 inches of openings, expansion joints, corners and similar conditions, and at intervals, not exceeding 8 inches, around perimeter.
    - d. Provide additional anchors as needed where tie spacing is not sufficient to maintain 16 inch on center spacing each way.
    - e. Provide additional anchors one course below base flashing to hold veneer wythe below flashing during grouting. Space anchors at 24 inches on center horizontally, maximum.
  - 3. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
    - a. Use adjustable-type (two-piece-type with eyelets and pintles) reinforcement to allow for differential movement regardless of whether bed joints align.
    - b. Provide additional individual adjustable anchors as needed where tie spacing is not sufficient to maintain 16 inch on center spacing each way and as follows:
      - 1) At base of wall, within 12 inches of horizontal leg of through-wall flashing, provide adjustable veneer anchors. Install in joint indicated and space at 32 inches o.c.
      - 2) Install additional anchors within 12 inches of openings, expansion joints, corners and similar conditions, and at intervals, not exceeding 8 inches, around perimeter.
      - 3) Provide additional anchors one course below base flashing to hold veneer wythe below flashing during grouting. Space anchors at 24 inches on center horizontally, maximum.
  - 4. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- C. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
  - 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

2. Fit insulation between back vertical leg of steel lintels and backup wythe and sheathing as occurs prior to installation of through wall flashing. Trim insulation to slope as indicated. Butt ends of insulation tightly.

### 3.7 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
  1. General: Place adjustable masonry veneer anchors prior to application of spray-applied air barrier.
  2. Fasten screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
  3. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and backup substrate.
  4. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  5. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings, expansion joints, corners and similar conditions, and at intervals, not exceeding 8 inches, around perimeter.
    - a. Provide additional anchors as needed where tie spacing is not sufficient to maintain 16 inch on center spacing each way.
    - b. Provide additional anchors within 12 inches above horizontal leg of through-wall flashing and lintel flashing. Space anchors at intervals of 32 inches horizontally.
    - c. Provide additional anchors one course below base flashing to hold veneer wythe below flashing during grouting. Space anchors at 24 inches on center horizontally, maximum.
- B. Provide not less than 1-3/4 inch of airspace between back of masonry veneer and face of insulation.
  1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

### 3.8 CAVITY-WALL INSULATION

- A. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
  1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.
  2. Fit insulation between back vertical leg of steel lintels and backup wythe and sheathing as occurs prior to installation of through wall flashing. Trim insulation to slope as indicated. Butt ends of insulation tightly.

### 3.9 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  - 1. Space reinforcement not more than 16 inches o.c.
  - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings[ in addition to continuous reinforcement].
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units or provide rigid anchors.
- D. Provide continuity at corners by using prefabricated L-shaped units or provide rigid anchors.

### 3.10 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
  - 1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
  - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
  - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

### 3.11 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows (042000.A46):
  - 1. At 4-hour fire-rated walls, fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
  - 2. At 2-hour fire-rated walls, install sash block on each side of joint, install preformed gasket, rake back mortar to allow for installation of backer rod and sealant, or install square-end block on each side of joint, fill head joint between block with ceramic fiber felt, rake back mortar to allow for installation of backer rod and sealant.
  - 3. At non-fire-rated walls, install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Form expansion joints in brick as follows (04200.A47):
  - 1. Build in compressible joint fillers where indicated.

2. Form open joint full depth of brick wythe and of width indicated, but not less than 1/2 inch for installation of compressible filler and, sealant and backer rod specified in Section 079200 "Joint Sealants."
- D. Provide horizontal, pressure-relieving joints (04200.A48) by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch.
1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

### 3.12 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

### 3.13 FLASHING, WEEP HOLES, CAVITY VENTS AND CAVITY DRAINAGE

- A. General: Install embedded flashing, weep holes and cavity drainage material in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
  1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar (creating a "mortar wash" sloping towards exterior face of wall) and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
    - a. Where flashing is within air cavity, place through-wall flashing on sloping bed of mortar (creating a "mortar wash").
    - b. At bases of walls, where flashing abuts a vertical obstruction such as hollow metal frame, aluminum frame, etc., place through-wall flashing on sloping bed of mortar (creating a "mortar wash") to slope away from obstruction for 4 inches.
  2. At multiwythe masonry walls, including cavity walls, provide through wall flashing with stainless steel drip edge. Continuously adhere drip edge to supporting substrate and then adhere through wall flashing to drip edge. Extend flashing from exterior face of outer wythe, through outer wythe, across airspace and over mortar wash, turned up not less than 16 inches onto backup substrate. Securely fasten top of flashing to backup substrate with continuous termination bars. Anchor termination bars to backup substrate and seal top of termination bar watertight.
    - a. Where through-wall flashing abuts vertical obstructions and becomes discontinuous, turn up not less than 2 inches to form end dams and seal watertight to adjacent construction and trim flush with exterior face of masonry.
  3. At masonry-veneer walls, provide through wall flashing with stainless steel drip edge. Continuously adhere drip edge to veneer and then adhere through wall flashing to drip edge. Extend flashing through veneer,

- across airspace behind veneer and over mortar wash, turned up not less than 16 inches onto backup substrate (sheathing, concrete, etc). Tuck upper edge of through wall flashing under air barrier, lapping at least 4 inches, unless otherwise indicated. Securely fasten top of flashing to backup substrate with continuous termination bars. Anchor termination bars to backup substrate and seal top of termination bar watertight.
- a. Where through-wall flashing abuts vertical obstructions and becomes discontinuous, turn up not less than 2 inches to form end dams and seal watertight to adjacent construction and trim flush with exterior face of masonry.
  4. At lintels and shelf angles, extend flashing a minimum of 8 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams. Extend flashing up exterior face of backup substrate not less than 16 inches and terminate with terminations bars and sealant as previously specified. Trim flashing at end dams flush to exterior brick face.
  5. Drip Edges: Provide metal drip edges beneath flexible flashing (through wall flashing) at exterior face of wall at all locations where through-wall flashing extends to exterior. Extend 1/2 inch beyond exterior face of outer wythe and pre-bend to form a drip.
    - a. Adhered stainless steel drip edge to lintel and adhered to flexible through-wall flashing on top of drip edge, overlapping 1-1/2 inches, minimum. Through wall flashing shall be held back from exterior face of masonry 1/2 inch.
  6. Termination Drip Edging: Provide stainless steel termination drip edging over exposed exterior flanges of lintels.
  7. Cores: Fill cores in masonry below flexible through-wall flashing with mortar.
  8. Cut exposed vertical edges of flexible flashing end dams off flush with face of wall after mortar is set.
  9. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install counterflashing receivers and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing. At single-wythe CMU flashing system, install weep vents in head joints at base of second course of masonry.
1. Use specified weep/cavity vent products to form weep holes.
  2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
  3. Space weep holes 24 inches o.c. unless otherwise indicated.
  4. Space weep holes formed from wicking material 16 inches o.c.
  5. Trim wicking material flush with outside face of wall after mortar has set.
- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

- F. Install cavity vents in head joints in exterior wythes at 24 inches on center. Use specified weep/cavity vent products to form cavity vents.

### 3.14 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
  - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
  - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  - 2. Limit height of vertical grout pours to not more than 60 inches.

### 3.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to TMS 402/ACI 530/ASCE 5 as follows:
  - 1. Level "B" for all areas except High Wind Areas and Storm Shelters.
  - 2. Level "C" for High Wind Areas and Storm Shelters.
  - 3. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
  - 4. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
  - 5. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For site-mixed mortar, test each mix provided, according to ASTM C 780.



- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

### 3.16 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on mockup sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  - 5. Initially, clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20. Where initial cleaning results are not satisfactory as judged by Architect from testing on mockup, proceed to cleaning with proprietary cleaners.
  - 6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
  - 7. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

### 3.17 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Excess Masonry Waste: Remove excess clean masonry waste and other masonry waste, and legally dispose of off Owner's property.

### 3.18 CLEANING OF EXISTING BRICK MASONRY

- A. General Cleaning of Masonry:

1. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other.
  2. Perform each cleaning method indicated in a manner which results in uniform coverage of all surfaces, including corners, moldings, interstices and which produces an even effect without streaking or damage to masonry surfaces.
  3. Rinse off chemical residue and soil by working upwards from bottom to top of each treated area at each stage or scaffold setting.
  4. Water Application Methods: Spray Applications: Spray-apply water to masonry surfaces to comply with requirements indicated for location, purpose, water temperature, pressure, volume and equipment. Unless otherwise indicated, hold spray nozzle not less than 6" from surface of masonry and apply water from side to side in overlapping bands to produce uniform coverage and an even effect.
    - a. Low Pressure Spray: 100-400 psi; 3-6 gallons per minute.
    - b. Medium Pressure Spray: 400-800 psi; 3-6 gallons per minute (only upon approval of Architect).
    - c. High Pressure Spray: Only allowed when approved by Architect and based upon field sample mockup testing results.
    - d. Steam Wash: Apply steam to masonry surfaces at pressures not exceeding 80 psi. Hold nozzle no less than 6" from surface of masonry and apply steam from side to side or in direction of tooling in overlapping bands to produce uniform coverage and an even effect.
  5. Chemical Cleaner Application Methods: Use only when directed by Architect, after performing water only cleaning methods described above.
    - a. General: Apply chemical cleaners to masonry surfaces to comply with chemical manufacturer's recommendations using brush or spray application methods, at Contractor's option, unless otherwise indicated. Do not allow chemicals to remain on surface for periods longer than that indicated or recommended by manufacturer.
    - b. Spray Application: Apply to pressures not exceeding 50 psi, unless higher pressure is recommended by chemical cleaner manufacturer.
    - c. Reapplication of Chemical Cleaners: Do not apply chemical cleaners to same masonry surfaces more than twice.
- B. Cleaning Brickwork:
1. Cold Water Wash: At locations indicated, clean brick masonry surface with cold water applied as follows:
    - a. Low pressure spray.
    - b. Medium pressure spray.
  2. Warm Water Wash: At locations indicated, clean brick masonry surfaces with warm water applied as follows:
    - a. Low pressure spray
    - b. Medium pressure spray.
  3. Chemical Cleaning: At locations indicated, clean brick masonry surfaces with chemical cleaner applied as follows:
    - a. Prewet masonry with cold water applied by low pressure spray.
    - b. Prewet masonry with warm water applied by low pressure spray.
    - c. Apply chemical cleaner to masonry. Let cleaner remain on surface for period determined from preconstruction testing, scrub and thoroughly rinsing away:
      - 1) As recommended by chemical cleaner manufacturer and preconstruction testing.
    - d. Rinse masonry with chemical afterwash to remove chemicals and soil, applied by medium pressure spray.

- e. Repeat chemical cleaning procedure above where required to produce effect established by mock-up.  
Do not apply more than twice.
- f. Do not clean brick work prior to seven (7) days after completion of the tuckpointing.

END OF SECTION 042000



## **SECTION 044319 - ADHERED THIN MASONRY VENEER**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Thin brick adhered to cold-formed metal framing and cement board sheathing (044319.A02).
- B. Related Requirements:
  - 1. Section 042000 "Unit Masonry" for brick masonry requirements.

#### **1.2 REFERENCES**

- A. ANSI A108.01 General Requirements: Subsurface and Preparation by Other Trades.
- B. ANSI A108.13 Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Stone and Dimension Stone.
- C. ANSI A118.4 Specifications for Latex-Portland Cement Mortar.
- D. ANSI A118.10 Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Stone and Dimension Stone Installations.

#### **1.3 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each thin brick, accessory, and manufactured product.
  - 1. Include data for setting mortar, pointing mortar and liquid waterproofing.
- B. Shop Drawings: Show fabrication and installation details for thin brick applications. Include dimensions, details of sheathing and trim, anchorages if any, and indication of finished faces.
  - 1. Indicate locations, dimensions, and details of thin-brick units, details of reinforcement, including corner units and special shapes, joint treatment, trim and terminations.
- C. Samples for Verification:
  - 1. For each type of thin-brick unit required, showing full range of color and texture expected.
  - 2. For each color of exposed mortar required.
    - a. Include color charts consisting of actual sections of mortar showing manufacturer's full range of colors available.
    - b. Pointing Mortar Samples for Verification: For each color and texture selected.

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For Installer.
- B. List of Materials Used in Constructing Field Sample/Mockups: List generic product names together with manufacturers, manufacturers' product names, supply sources, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.
  - 1. Neither receipt of list nor approval of mockups constitutes approval of deviations from the Contract Documents contained in mockups unless Architect approves such deviations in writing.
- C. Material Test Reports:
  - 1. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.
- D. Material Certificates: For the following items:
  - 1. Thin-brick units and accessories.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs experienced masons. Installer shall have completed not less than 3 thin masonry veneer installations similar in material, design and extent to that indicated for this Project, and with a record of successful in-service performance.
- B. Field Samples: Build field sample to demonstrate aesthetic effects and to set quality standards for materials and execution for each system specified.
  - 1. Build field sample for typical interior wall area. Size for field sample shall not be less than 10 square feet and shall include the end of the wall showing pre-manufactured corner units.
  - 2. Approval of field sample does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved field sample will become part of the completed Work if undisturbed at time of Substantial Completion.
- C. Source Limitations for Thin Brick: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- D. Source Limitations for Mortar Materials: Obtain mortars and waterproofing materials from a single manufacturer and from single source.

## 1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Sealant Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for compatibility and adhesion testing according to sealant manufacturer's standard testing methods and Section 079200 "Joint Sealants," Samples of materials that will contact or affect joint sealants.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of thin brick with related work to avoid delaying the Work and to minimize the need for on-site storage.
- B. Pack, handle, and ship thin brick in suitable packaging.
- C. Deliver preblended, dry mortar mixes in moisture-resistant containers with manufacturer's identification. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, in a dry location.
- D. Store waterproofing materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees F and not above 100 degrees F in accordance with manufacturer's instructions.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.

## 1.9 FIELD CONDITIONS

- A. Protection of Thin Masonry Veneer: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed thin masonry veneer when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining thin masonry veneer face.
  - 1. Protect base of walls from rain-splashed mud and mortar splatter using coverings spread on the ground and over the wall surface.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 4. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed stone masonry.
- C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## 1.10 COORDINATION

- A. Advise installers of other work about specific requirements for placement of flashing, weep system and similar items to be built into thin masonry veneer.

## PART 2 - PRODUCTS

### 2.1 THIN BRICK (044319.A02)

- A. Basis-of-Design Products: Subject to compliance with requirements, provide the following types of thin brick, or comparable thin brick submitted to and accepted by Architect prior to bidding:
  - 1. Brick Type UM3: Endicott; Glazed Grey, SN7, smooth textured.
- B. Thin Brick: Not less than 1/2 inch or more than 3/4 inch thick, and as follows:
  - 1. Dimensional Tolerances: Plus 0 inch or minus 1/16 inch for any dimension 8 inches or less and plus 0 inch or minus 3/32 inch for any dimension more than 8 inches.
  - 2. Out-of-Square Tolerance: Plus or minus 1/16 inch.
  - 3. Warpage Tolerance: Plus 0 inch or minus 1/16 inch.
  - 4. Variation of Shape from Specified Angle: Plus or minus one degree.
  - 5. Modulus of Rupture: Not less than 250 psi when tested according to ASTM C 67.
  - 6. Tensile Bond Strength: Not less than 150 psi when tested before and after freeze-thaw test according to ASTM E 488 as modified: Adhere a steel plate with a welded rod on a single thin-brick face with epoxy for each test.
  - 7. 24-Hour Cold-Water Absorption: Not more than 6 percent when tested according to ASTM C 67.
  - 8. Freeze-Thaw Resistance: No detectable disintegration or separation after 300 freezing-and-thawing cycles when tested according to ASTM C 666/C 666M, Method B.
  - 9. Chemical Resistance: Tested according to ASTM C 650 and rated "not affected."
  - 10. Efflorescence: Tested according to ASTM C 67 and rated "not effloresced."
- C. Back Surface Texture: Scored, combed, wire roughened, ribbed, keybacked, or dovetailed.
- D. Face Size:
  - 1. 2-1/4 inches high by 7-5/8 inches long.
- E. Special Shapes: Include corners, edge corners, and end edge corners.

### 2.2 MORTAR AND SETTING MATERIALS

- A. Adhesive for Thin Brick: Provide water-cleanable tile-setting epoxy complying with ANSI A118.3.
  - 1. Organic adhesive complying with ANSI A 136.1, Type 1 may be considered.
- B. Mortar: Provide pre-manufactured and prepackaged polymer fortified non-sag, high bond strength mortar specifically designed for installation of adhered thin masonry veneer. Mortar shall be reinforced with Kevlar. Mortar shall have antimicrobial additive to inhibit mold and mildew. Mortar shall meet or exceed ANSI A118.4 performance criteria.
  - 1. Basis of Design Product: Laticrete International, Inc.; Hi-Bond Masonry Veneer Mortar or comparable product from manufacturers listed below meeting specified requirements and from same manufacturer as pointing mortar and liquid waterproofing.
    - a. Custom Building Products.
    - b. Mapei.
    - c. MerKrete Systems/Parex USA, Inc.
  - 2. Color: As selected by Architect from manufacturer's full range.
- C. Pointing Mortar: Provide factory-prepared and prepackaged pointing mortar consisting of high strength portland cement, graded aggregates and colorfast pigments.
  - 1. Basis of Design Product: Laticrete International, Inc.; Pointing Mortar or comparable product from other manufacturers meeting specified requirements and from same manufacturer as mortar and waterproofing.
  - 2. Color: Match Solomon Colors, Inc.; "H Series", color number "94H" as acceptable to Architect.

- D. Liquid Waterproofing: Provide pre-manufactured and prepackaged thin, load bearing single component self-curing liquid rubber polymer that forms a flexible and seamless waterproofing and crack isolating membrane, containing antimicrobial additives. Waterproofing shall exceed ANSI A118.10 and ANSI A118.12 performance criteria.
  - 1. Performance Criteria:
    - a. Meets ICC-ES AC212: Acceptance Criteria for Resistive Coatings used as Water Resistive Barriers over Exterior Sheathing.
    - b. Meets ICC-ES AC38: Acceptance Criteria for Water-Resistive Barriers.
    - c. Passes ASTM D 1970-01 for fastener sealability.
    - d. Water Vapor Transmission Rate: Not less than 1 perm according to ASTM e 96-00e1 (Procedure B).
    - e. 7-Day Hydrostatic Test: Passes ANSI A118.10.
    - f. 7-Day Tensile Strength: 265 to 300 psi when tested in accordance with ANSI A118.10.
    - g. 7-Day Water Immersion: 95 – 120 psi when tested in accordance with ANSI A118.10.
    - h. 7-Day Shear Bond: 200 -275 psi when tested in accordance with ANSI A118.10.
    - i. 7-Day Shear Strength: 214 -343 psi when tested in accordance with ANSI A118.10.
  - 2. Basis of Design Product: Laticrete International, Inc.; 'Air & Water Barrier' or comparable product from other manufacturers meeting specified requirements and from same manufacturer as mortar and pointing mortar.
- E. Water: Potable.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in stone masonry mortar.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Davis Colors; True Tone Mortar Colors.
    - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
    - c. Solomon Colors; SGS Mortar Colors.
    - d. Other manufacturer's recommended by pointing mortar manufacturer.

### 2.3 MISCELLANEOUS ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.
  - 1. Basis of Design Product: W. R. Meadows; "Ceramar.
- B. Sealants: Provide Dow Corning "790 Silicone Building Sealant" or Laticrete "MVIS Silicone Sealant".
- C. Aluminum Trim:
  - 1. Expansion/Movement Joint Trim: Basis-of-Design, provide Schluter; DILEX-BT satin anodized aluminum trim, Model AEBT-125. Trim shall be ½ inch high by 1-19/32 inch wide. Trim shall incorporate nailing/setting flanges.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces indicated to receive thin masonry veneer, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of thin masonry veneer.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean dirty or stained masonry surfaces by removing soil, stains, and foreign materials before setting. Clean masonry by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.
- B. Prior to thin masonry veneer installation, install waterproofing in strict accordance with waterproofing manufacturer's written instructions. Cover all surfaces of cementitious backing panels.
- C. Coordinate installation of adhered thin masonry veneer with installation of cementitious sheathing board and metal flashing.



### 3.3 SETTING OF THIN BRICK MASONRY VENEER, GENERAL

- A. Sort thin brick before it is placed in wall to remove thin brick that does not comply with requirements relating to aesthetic effects, chipping, physical properties, fabrication, or that is otherwise unsuitable for intended use.
- B. Arrange thin brick in oriented horizontally in a ½ running bond pattern.
- C. Install aluminum trim in accordance with trim manufacturer's written instructions and approved shop drawings.
- D. Adhere thin brick to substrate complying with requirements indicated on Drawings. Install supports and other attachments indicated or necessary to secure thin brick masonry in place. Set thin brick accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
- E. Maintain uniform joint widths except where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than 1/4 inch at narrowest points or more than 3/8 inch at widest points.
- F. Form expansion joints in thin brick with aluminum trim.
- G. Provide sealant joints of widths and at locations indicated.
  - 1. Keep sealant joints free of mortar and other rigid materials.
  - 2. Sealing joints is specified in Section 079200 "Joint Sealants."

### 3.4 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet or 3/4 inch in 40 feet or more.
- D. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.
- E. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

### 3.5 INSTALLATION OF ADHERED THIN MASONRY VENEER

- A. Install adhered thin masonry veneer in accordance with mortar manufacturer's written recommendations.
- B. Extend thin masonry veneer work into recesses and under or behind fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of thin masonry veneer without marring visible surfaces. Carefully grind cut edges of thin masonry veneer abutting trim, finish, or built-in items for straight aligned joints. Fit thin masonry veneer closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap thin masonry veneer.
- D. Install waterproofing over entire surface to receive adhered thin masonry veneer, and sheet metal flashing covering all exposed surfaces of substrate, with the exception of the concrete base. Flash penetrations through waterproofing as recommended by waterproofing manufacturer. Apply to achieve a dry film thickness of 20 to 30 mils.
- E. Coat backs of thin masonry veneer units and face of waterproofing with setting mortar. Tap units into place, completely filling space between units and waterproofing backup.
- F. Rake out joints for pointing with mortar to depth of not less than ½ inch before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

### 3.6 POINTING

- A. Install pointing mortar in accordance with pointing manufacturer's recommendations to suit conditions involved.
- B. Prepare joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch deep until a uniform depth is formed.
- C. Point joints by placing and compacting pointing mortar in layers of not more than 3/8 inch deep. Compact each layer thoroughly and allow to it become thumbprint hard before applying next layer.
- D. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
  - 1. Joint Profile: Concave.

### 3.7 ADJUSTING AND CLEANING

- A. Remove and replace thin masonry veneer of the following description:
  - 1. Broken, chipped, stained, or otherwise damaged masonry. Stone may be repaired if methods and results are approved by Architect. Damaged thin brick shall be replaced.
  - 2. Defective joints.
  - 3. Thin masonry veneer masonry not matching approved samples and mockups.
  - 4. Thin masonry veneer masonry not complying with other requirements indicated.
- B. Replace in a manner that results in thin masonry veneer matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean thin masonry veneer as work progresses. Remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean thin masonry veneer as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning thin masonry veneer.
  - 3. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

### 3.8 EXCESS MATERIALS AND WASTE

- A. Excess Thin Brick: Store excess thin brick where directed by Owner for Owner's use.
- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other waste, and legally dispose of off Owner's property.

**END OF SECTION 044319**

## **SECTION 051200 - STRUCTURAL STEEL FRAMING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

##### **A. Section Includes:**

1. Structural steel (051200.A01), including, but not limited to the following:
  - a. W-Shapes (051200.A02)
  - b. Channels (051200.A03)
  - c. Angles (051200.A04)
  - d. Plate and Bar (051200.A05)
  - e. Cold-Formed Hollow Structural Steel Shapes (051200.A06)
2. Field-installed shear connectors.
3. Shrinkage-resistant grout (051200.A08).
4. Structural thermal break material.

##### **B. Related Requirements:**

1. Section 012300 "Alternates" for alternates effecting work of this Section.
2. Section 014000 "Quality Requirements" for independent testing agency procedures and administrative requirements.
3. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
4. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other steel items not defined as structural steel.

#### **1.2 DEFINITIONS**

- ##### **A. Structural Steel:** Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

#### **1.3 COORDINATION**

- ##### **A.** Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- ##### **B.** Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

#### **1.4 PREINSTALLATION MEETINGS**

- ##### **A. Preinstallation Conference:** Conduct conference at Project site at biweekly intervals.

1. Before installation of structural steel framing, review procedures and tolerances for ensuring quality of structural steel framing materials. Require representatives of each entity directly concerned with structural steel framing to attend, including but not limited to the following:
  - a. Owner's representative

- b. Architect and/or Structural Engineer.
  - c. Contractor's superintendent.
  - d. Structural Steel Framing subcontractor.
  - e. Manufacturer's representative for structural steel framing.
2. Review field quality control measures for the following items:
- a. Field dimensions and tolerances for structural steel framing installation.

#### 1.5 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.
5. Threaded rods.
6. Slide bearings.
7. Shop primer.
8. Galvanized-steel primer.
9. Etching cleaner.
10. Galvanized repair paint.
11. Shrinkage-resistant grout.
12. Structural thermal break materials.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. For structural-steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: Submit for each of the following.

1. Installer.

2. Fabricator.
  3. Professional engineer.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:
1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
  2. Direct-tension indicators.
  3. Tension-control, high-strength, bolt-nut-washer assemblies.
  4. Shear stud connectors.
  5. Shop primers.
  6. Shrinkage-resistant grout.
- F. Survey of existing conditions.
- G. Source quality-control reports.
- H. Field quality-control and special inspection reports.

#### 1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).
1. Non-certified fabricators shall submit their qualifications with their bid. Qualifications shall be submitted on AIA Document A305 "Qualifications Statement", include the following for each project listed: references for at least 3 projects, identify engineer-of-record, tonnage of steel fabricated and type of steel fabricated (structural, miscellaneous, etc.).
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE, and as follows:
1. A firm with not less than ten (10) years of experience under the current name.
  2. Must have completed five (5) projects within the past 5 years of comparable size and scope.
  3. Non-certified erectors shall submit their qualifications with their bid. Qualifications shall be submitted on AIA Document A305 "Qualifications Statement", include the following for each project listed: references for at least 3 projects, identify engineer-of-record, tonnage of steel erected and type of steel erected (structural, miscellaneous, etc.).

- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Comply with applicable provisions of the following specifications and documents:
  - 1. AISC 303.
  - 2. AISC 360.
  - 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

#### 1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with structural steel framing by field measurements before fabrication.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
  - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
  - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
  - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
  - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

### PART 2 PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
  - 1. Select and complete connections using schematic details indicated and AISC 360.
  - 2. Use Allowable Stress Design; data are given at service-load level.
- B. Moment Connections: Type FR, fully restrained.
- C. Construction: Combined system of moment frame, braced frame, and shear walls.

## 2.2 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
  - 1. W-Shapes: 60 percent.
  - 2. Channels, Angles, M, S-Shapes: 60 percent.
  - 3. Plate and Bar: 25 percent.
  - 4. Cold-Formed Hollow Structural Sections: 25 percent.
  - 5. All Other Steel Materials: 25 percent.
- C. W-Shapes (051200.A02): ASTM A 992/A 992M.
- D. Channels (051200.A03), Angles (051200.A04), M, S-Shapes: ASTM A 36/A 36M.
- E. Plate and Bar (051200.A05): ASTM A 36/A 36M.
- F. Cold-Formed Hollow Structural Sections (051200.A06): ASTM A 500/A 500M, Grade C, structural tubing.
- G. Welding Electrodes: Comply with AWS requirements.

## 2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.
  - 1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.
- C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
  - 1. Finish: Plain.
- D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

## 2.4 RODS

- A. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable, straight.
  - 1. Nuts: ASTM A 563 heavy-hex carbon steel.

2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Finish: Plain.

B. Threaded Rods: ASTM A 36/A 36M.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Washers: ASTM A 36/A 36M carbon steel.
3. Finish: Plain.

## 2.5 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer compatible with topcoat.
- B. Galvanizing Repair Paint: ASTM A 780/A 780M.

## 2.6 FILLER

- A. Filler: Polyester filler intended for use in repairing dents in automobile bodies.

## 2.7 SHRINKAGE-RESISTANT GROUT (051200.A08)

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## 2.8 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
1. Camber structural-steel members where indicated.
  2. Fabricate beams with rolling camber up.
  3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
  4. Mark and match-mark materials for field assembly.
  5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. In addition to special care used to handle and fabricate structural steel exposed to view in final position, comply with the following:
1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.
  2. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and edges.



3. Fabricate with exposed surfaces free of mill marks, including rolled trade names and stamped or raised identification.
  4. Fabricate with exposed surfaces free of seams to maximum extent possible.
  5. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
  6. Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.
  7. Seal-weld open ends of hollow structural sections with 3/8-inch closure plates.
- C. Coping, Blocking, and Joint Gaps: Maintain uniform gaps of 1/8 inch with a tolerance of 1/32 inch.
- D. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
  2. Thermal Cutting is not allowed at the project site.
- E. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- F. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- G. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning." or SSPC-SP 2, "Hand Tool Cleaning."
- H. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
  2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
  3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## 2.9 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.
  2. Erection plates shall be removed after welding and prior to finishing.

## 2.10 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
  - 1. Surfaces to be field welded.
  - 2. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
  - 3. Galvanized surfaces.
  - 4. Surfaces enclosed in interior construction (not exposed-to-view in final position).
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  - 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
  - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

## 2.11 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
  - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
  - 2. Galvanize lintels, shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.
  - 3. Galvanize all exterior exposed structural steel.

## 2.12 STRUCTURAL THERMAL BREAK MATERIAL

- A. Basis of Design: Subject to compliance with requirements, provide "Fabreeka – TIM" by Fabreeka or a comparable product submitted to and accepted by Architect prior to bidding, with the following product characteristics.
  - 1. Description: Material shall maintain structural integrity of connections. Refer to Structural Drawings for specific load requirements.
  - 2. Thickness: 1 inch unless indicated otherwise on Structural Drawings.
  - 3. Ultimate Material Properties:
    - a. 11,000 psi (75.8 MPa) per ASTM D638.
    - b. 25,000 psi (172.4 MPa) per ASTM D790.
    - c. 38,900 psi (26832 MPa) per ASTM D695.

- d. Compressive Modulus:
  - 1) 291,194 psi (2,007.7 MPa) per ASTM D695.
  - 2) 519,531 psi (3582.0 MPa) per ASTM D695.
- e. 15,000 psi (103.4 MPa) per ASTM D732.
- f. 21.8% per ASTM D2863.
- g. Coefficient of Thermal Expansion: 2.2 per ASTM D696.
- h. 1.8 BTU/Hr/sf/in/Deg F (0.259 W/m\*deg K) per ASTM C177.
- i. 107.83 lb/cf (1727 Kg/cubic meter).
- j. Coefficient of Friction Values with Steel: 0.27 (at 5,000 psi) and 0.26 (10,000 psi).

## 2.13 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
  - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
  - 1. Liquid Penetrant Inspection: ASTM E 165.
  - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
  - 3. Ultrasonic Inspection: ASTM E 164.
  - 4. Radiographic Inspection: ASTM E 94.
- D. Prepare test and inspection reports.
- E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents
- F. Special Inspections: Owner will retain and pay for the services of a qualified independent inspection agency acceptable to the Architect to conduct special inspections of all structural welding and high-strength bolting in accordance with applicable requirements of Section 1704 of the International Building Code, latest edition, as adopted and amended by authority having jurisdiction. The inspection agency shall inspect the work, prepare and submit periodic reports and final reports to City Code Officials, Architect, and Owner in compliance with building code requirements.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
  - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads.

Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

### 3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

- B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

- E. Splice members only where indicated.

- F. Do not use thermal cutting during erection unless approved by Structural Engineer of Record. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

1. Do not use thermal cutting during erection for AESS.

- a. **[ VERIFY - AESS ]**

- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Structural Thermal Break Material: Install per manufacturer's written recommendations to achieve load performance indicated by Structural Drawings. Installation methods shall be submitted to Structural Engineer for review of compliance with design intent only.

### 3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
  - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
  - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

### 3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  - 1. Verify structural-steel materials and inspect steel frame joint details.
  - 2. Verify weld materials and inspect welds.
  - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
  - 1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
  - 2. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
    - a. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
      - 1) Liquid Penetrant Inspection: ASTM E 165.
      - 2) Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
      - 3) Ultrasonic Inspection: ASTM E 164.
      - 4) Radiographic Inspection: ASTM E 94.
- C. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
  - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.

2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

### 3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.
- B. Touchup Prime Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 051200

## **SECTION 052100 - STEEL JOIST FRAMING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. K-series steel joists (052100.A02).
2. KCS-type K-series steel joists (052100.A03).
3. K-series steel joist substitutes (052100.A04).
4. Joist accessories.

**B. Related Requirements:**

1. Section 012300 "Alternates" for alternates effecting work of this Section.
2. Section 014000 "Quality Requirements" for independent testing agency procedures and administrative requirements.
3. Section 033000 "Cast-in-Place Concrete" for installing bearing plates in concrete.
4. Section 042000 "Unit Masonry" for installing bearing plates in unit masonry.
5. Section 051200 "Structural Steel Framing" for field-welded shear connectors.
6. Section 053100 "Steel Decking" for structural steel decking.
7. Section 055000 "Metal Fabrications" for bearing plates to be embedded in other construction.

#### **1.2 DEFINITIONS**

- A. SJI's "Specifications":** Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists:** Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

#### **1.3 ACTION SUBMITTALS**

- A. Product Data:** For each type of joist, accessory, and product.
- B. Shop Drawings:**
1. Include layout, designation, number, type, location, and spacing of joists.
  2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data:** For manufacturer and professional engineer.
- B. Welding certificates.**
- C. Mill certificates for each type of bolt.**

- D. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
  - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

#### 1.7 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

### PART 2 PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
  - 1. Use ASD; data are given at service-load level.
  - 2. Design special joists to withstand design loads with deflections no greater than the following:
    - a. Roof Joists: Vertical deflection of 1/240 total load of the span.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

#### 2.2 K-SERIES STEEL JOISTS (052100.A02 AND 052100.A03)

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
  - 1. Joist Type:
    - a. K-series steel joists (052100.A02)
    - b. KCS-type K-series steel joists (052100.A03)
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
- C. Provide holes in chord members for connecting and securing other construction to joists.



- D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

### 2.3 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

### 2.4 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.
  - 1. Finish: Plain.
- C. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
  - 1. Finish: Plain.
- D. Welding Electrodes: Comply with AWS standards.
- E. Galvanizing Repair Paint: or ASTM A 780.
- F. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

### 2.5 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Shop prime paint joists and accessories except the following:
  - 1. Surfaces to be field welded.
  - 2. Surfaces of high-strength bolted, slip-critical connections.
  - 3. Surfaces enclosed in interior construction (not exposed-to-view in final position).
  - 4. Galvanized surfaces.
- C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
  - 1. Space, adjust, and align joists accurately in location before permanently fastening.
  - 2. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
  - 3. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

### 3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.
- B. Visually inspect field welds according to AWS D1.1/D1.1M.
- C. Visually inspect bolted connections.
- D. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.
- E. Perform additional testing to determine compliance of corrected Work with specified requirements.

### 3.4 PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.

1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
  2. Apply a compatible primer of same type as primer used on adjacent surfaces.
  3. Cleaning and touchup painting are specified in Section 099113 "Exterior Painting", Section 099123 "Interior Painting" and Section 099600 "High-Performance Coatings."
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100



## **SECTION 053100 - STEEL DECKING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Roof deck (053100.A01)
2. Acoustical roof deck (053100.A02)

**B. Related Requirements:**

1. Section 014000 "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
4. Section 099123 "Interior Painting" for repair painting of primed deck and finish painting of deck.

**C. Products Furnished but not Installed Under this Section:**

1. Mesh spacers and acoustical insulation strips for the acoustical deck shall be installed under work of Section 075216.

#### **1.2 ACTION SUBMITTALS**

**A. Product Data:** For each type of deck, accessory, and product indicated.

**B. Shop Drawings:**

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

#### **1.3 INFORMATIONAL SUBMITTALS**

**A. Welding certificates.**

**B. Product Certificates:** For each type of steel deck.

**C. Product Test Reports:** Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.
2. Acoustical roof deck.

#### **1.4 QUALITY ASSURANCE**

**A. Welding Qualifications:** Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

**A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.**

- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
  - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

## PART 2 PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

### 2.2 ROOF DECK (053100.A01)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Canam United States; Canam Group Inc.
  - 2. Consolidated Systems, Inc.; Metal Dek Group
  - 3. Epic Metals Corporation
  - 4. Gooder-Henrichsen Company.
  - 5. New Millennium Building Systems, LLC.
  - 6. Nucor Corp; Vulcraft Group
  - 7. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.
- B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
  - 1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
    - a. Color: Manufacturer's standard.
  - 2. Deck Profile: As indicated.
  - 3. Profile Depth: As indicated.
  - 4. Design Uncoated-Steel Thickness: As indicated.
  - 5. Span Condition: Triple span or more.
  - 6. Side Laps: Overlapped.

### 2.3 ACOUSTICAL ROOF DECK (053100.A02)

- A. Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G90 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
  - a. Color: Manufacturer's standard.
  - b. Primers: Provide manufacturer's standard baked-on, lead and chromate free, rust inhibitive primer.
    - 1) Colors: Manufacturer's standard.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: Triple span or more.
6. Side Laps: Overlapped.
7. Acoustical Perforations: Pan shall be perforated with 5/32" holes staggered at 3/8" centers. Perforations in ribs is not acceptable.
8. Sound-Absorbing Insulation and Spacers: Manufacturer's standard 2 inch thick by 4-1/2 inch wide premolded roll or strip of glass or mineral fiber as required to meet the acoustical performance. Density of sound absorbing insulation shall be 3 psf. Mesh spacers for acoustical insulation shall be corrosion resistant, approximately 1/4" thick, continuous strips.
  - a. Installation of sound-absorbing insulation is specified in Section 075216.
9. Acoustical Performance: NRC 0.95, tested according to ASTM C 423.
  - a. Noise reduction coefficient shall be achieved with acoustical insulation only in deck pans without an additional layer of fiberglass insulation over top of deck.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Vulcraft; "DoveTail Deck 2.0DA" acoustical metal deck.
  1. Comparable products from other manufacturers meeting specified requirements, submitted to Architect prior to bidding will be considered.

## 2.4 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Flute Closure Strips: Vulcanized, closed cell foam rubber, 1 inch thick minimum; profiled to fit tight to the deck.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- G. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- I. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- J. Galvanizing Repair Paint: ASTM A 780 or SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.
- K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.
- L. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Locate deck bundles to prevent overloading of supporting members.
- C. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
  - 1. Align pans of acoustical deck panels over full length of pan runs.
- D. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.



### 3.3 ROOF-DECK INSTALLATION

- A. Secure roof-deck panels to steel supporting members by welding or mechanically fastening as indicated on Drawings.
  - 1. Fastening Method - General: Provide type and size of fasteners indicated on Drawing.
    - a. For additional requirements, refer to roofing Sections 075216.
  - 2. Fastener Spacing: Fasten edge and interior ribs of deck units at each support with number of fasteners as indicated on the Drawings not to exceed that recommended by mechanical fastener manufacturer and as based on roof-area definitions in FMG Loss Prevention Data Sheet 1-28.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding 12 inches on center, and as follows:
  - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
  - 2. Side Lap Fastening: As indicated on Drawings.
- C. End Bearing Fastening: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
  - 1. End Joints: Lapped 2 inches minimum.
- D. Welded Deck Installation:
  - 1. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
    - a. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
      - 1) Weld Diameter: 5/8 inch, nominal.
      - 2) Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Fasten edge and interior ribs of deck units at each support with number of welds as indicated on Drawings, not to exceed that recommended by deck manufacturer and as based on roof-area definitions in FMG Loss Prevention Data Sheet 1-28.
      - 3) Weld Washers: Install weld washers at each weld location.
- E. Roof Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches apart with at least one weld or fastener at each corner.
  - 1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.
- F. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
  - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- G. Install flexible flute closure strips at areas where steel decking penetrates between roof deck and soffit deck conditions.
  - 1. **[ FOR CONTINUOUS EXTERIOR SOFFITS WITHOUT A PARAPET ]**

### 3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

### 3.5 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
  - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

## **SECTION 054000 - COLD FORMED METAL FRAMING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes the following applications of cold-formed metal framing (054000.A01):
  - 1. Interior non-load-bearing wall framing exceeding height limitations of standard, nonstructural metal framing.
  - 2. Soffit framing (054000.A06).
  - 3. Miscellaneous framing and furring members (054000.A07).
  - 4. Miscellaneous materials.
    - a. Isolation Strip (054000.A08)
    - b. Sealer Gaskets
    - c. Flat straps and backing plates (054000.A09).
- B. Related Requirements:
  - 1. Section 012300 "Alternates" for those alternates related to work of this Section.
  - 2. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
  - 3. Section 092116 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

#### **1.2 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Before installation of cold formed metal framing, review procedures and tolerances for ensuring quality of metal framing materials. Require representatives of each entity directly concerned with cold-formed metal framing to attend, including but not limited to the following:
    - a. Owner's representative
    - b. Architect.
    - c. Contractor's superintendent.
    - d. Cold Formed Metal Framing subcontractor.
    - e. Manufacturer's representative for cold-formed metal framing.
  - 2. Review field quality control measures for the following items:
    - a. Field dimensions and tolerances for cold formed metal framing installation.
    - b. Coordination of items where blocking is required

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. Shop Drawings:
  - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
  - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: For cold-formed steel framing.

#### 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency and professional engineer.

B. Welding certificates.

C. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.

1. Steel sheet.
2. Power-actuated anchors.
3. Mechanical fasteners.
4. Vertical deflection clips.
5. Horizontal drift deflection clips
6. Miscellaneous structural clips and accessories.

D. Evaluation Reports: For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

#### 1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Product Tests: Mill certificates or data from a qualified independent testing agency, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

D. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

E. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

F. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing:

1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
  - 1. All Steel and Gypsum Products.
  - 2. CEMCO; California Expanded Metal Products Company.
  - 3. Clark-Dietrich Building Systems.
  - 4. Custom Stud, Inc.
  - 5. Engineered Steel Products, Inc.
  - 6. MBA Building Supplies.
  - 7. MarinoWare; a division of Ware Industries.
  - 8. SCAFCO Corporation.
  - 9. Steel Construction Systems.
  - 10. Steel Network, Inc.
  - 11. Steel Structural Systems.
  - 12. United Metal Products, Inc.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
  - 1. Design Loads: As indicated in per Code and the Structural General Notes.
  - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft.
    - b. Soffit Framing: Vertical deflection of 1/240 of the span for live loads and 1/240 for total loads of the span.
  - 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners

and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
    - a. Upward and downward movement of 1 inch.
  5. Design interior non-load-bearing framing as required for structural performance, including but not limited to: windows systems, operable walls, soffits and ceilings.
  6. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing – Header Design."
- C. Cold-Formed Steel Framing Design Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
1. Floor and Roof Systems: AISI S210.
  2. Wall Studs: AISI S211.
  3. Headers: AISI S212.
  4. Lateral Design: AISI S213.
- D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

### 2.3 COLD-FORMED STEEL FRAMING, GENERAL (054000.A01)

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
  1. Grade: As required by structural performance.
  2. Coating: G60.
- C. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
  1. Grade: As required by structural performance.
  2. Coating: G60.

### 2.4 INTERIOR NON-LOAD BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
  1. Minimum Base-Metal Thickness:

- a. For horizontal framing members: 0.0428 inch
    - b. For vertical framing members (where welding occurs): 0.0966 inch.
  - 2. Flange Width: 1-5/8 inches.
  - 3. Section Properties: Per SSMA or as required by structural performance.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
- 1. Minimum Base-Metal Thickness: Matching steel studs.
  - 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
- 1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
    - a. Minimum Base-Metal Thickness: 0.0538 inch.
    - b. Flange Width: 1 inch plus the design gap for one-story structures and 1 inch plus twice the design gap for other applications.
  - 2. Inner Track: Of web depth indicated, and as follows:
    - a. Minimum Base-Metal Thickness: 0.0428 inch.
    - b. Flange Width: 3 inches.
- E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

## 2.5 SOFFIT FRAMING (054000.A06)

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
- 1. Minimum Base-Metal Thickness: 0.0329 inch.
  - 2. Flange Width: 1-5/8 inches, minimum.
  - 3. Section Properties: In accordance with SSMA.

## 2.6 MISCELLANEOUS FRAMING (054000.A07)

- A. General: Manufacturer's standard Z-shaped and hat-shaped steel sections, of web depths indicated, and as follows:
- 1. Minimum Uncoated Base-Metal Thickness: 0.0538 inch.
  - 2. Z-Furring: Manufacturer's standard slotted or non-slotted web, face flange of at least 1-1/4 inches and wall attachment flange of 7/8 inch.
  - 3. Hat Channels: Manufacturer's standard profile.

4. Depth/Height:
  - a. For Z-furring: 3 inches, unless otherwise indicated.
  - b. For hat channels: 7/8 inch, unless otherwise indicated.

## 2.7 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
  1. Supplementary framing.
  2. Bracing, bridging, and solid blocking.
  3. Web stiffeners.
  4. Anchor clips.
  5. End clips.
  6. Foundation clips.
  7. Gusset plates.
  8. Stud kickers and knee braces.
  9. Joist hangers and end closures.
  10. Hole-reinforcing plates.
  11. Backer plates.

## 2.8 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 55, threaded carbon-steel headless bolts, with encased end threaded, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.
  1. Uses: Securing cold-formed steel framing to structure.
  2. Type: Torque-controlled adhesive anchor or adhesive anchor.
  3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.



4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
  1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

## 2.9 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or ASTM A 780.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- C. Shims: Load bearing, high-density multimonomer plastic, and non-leaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- D. Isolation Strip beneath Runner Tracks at Exterior Walls (054000.A08): Provide one of the following:
  1. Polyethylene-sheet backed rubberized asphalt membrane, 40 mils thick. Field cut to match widths of runners.
  2. Lamatek; 0.25 inch by 5.87 inches SCE-41 plain neoprene sponge rubber. Furnish in not less than 50 foot rolls.

## 2.10 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
  1. Fabricate framing assemblies using jigs or templates.
  2. Cut framing members by sawing or shearing; do not torch cut.
  3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
  4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
  - 1. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
  - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
  - 1. Cut framing members by sawing or shearing; do not torch cut.
  - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 07 21 00 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### 3.3 INTERIOR NON-LOAD BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
  - 1. Do not fasten studs to outer track of double deflection tracks.
  - 2. Stud Spacing: 16 inches, maximum.
  - 3. Additional Studs: Space 8 inches from opening jambs and each side of veneer expansion joints.  
Coordinate stud spacing with other masonry anchor locations.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
  - 1. Do not fasten studs to outer track of double deflection tracks.
  - 2. Install single deep-leg deflection tracks and anchor to building structure.
  - 3. Install double deep-leg deflection tracks and anchor outer track to building structure.
  - 4. Connect vertical deflection clips to bypassing and infill studs and anchor to building structure.
  - 5. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
  - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
1. Install solid blocking at centers indicated on Shop Drawings.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.
1. Strapping: Before installing sheathing, install continuous strapping at backup location for termination bar at the top of veneer base flashing and lintel flashing.

### 3.4 CEILING AND SOFFIT FRAMING INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
1. Install joists over supporting frame or flange of joist track as occurs, with a minimum end bearing of 1-1/2 inches.
  2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.
- C. Space joists not more than 2 inches from abutting walls parallel with joists, and as follows:
1. Joist Spacing: 16 inches.
- D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.
1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
1. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

### 3.5 MISCELLANEOUS FRAMING INSTALLATION

#### A. General:

1. Where miscellaneous framing is installed parallel to stud framing in wall, align miscellaneous framing over studs. Securely anchor at corners and ends, and at spacings as follows:
  - a. Anchor Spacing: As shown on Shop Drawings.
2. Where miscellaneous framing is installed perpendicular to stud framing in wall, secure over studs. Securely anchor at corners and ends, and at spacing as follows:
  - a. Anchor Spacing: As shown on Shop Drawings.
3. Set miscellaneous framing plumb, level and true to plane.

### 3.6 ERECTION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### 3.7 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.8 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000



## **SECTION 054400 - COLD FORMED METAL TRUSSES**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Cold-formed steel trusses for roofs.

**B. Related Requirements:**

1. Section 054000 "Cold-Formed Metal Framing" for cold-formed steel studs, and joists.

#### **1.2 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference:** Conduct conference at Project site.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data:** For each type of product.

**B. Shop Drawings:**

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel trusses; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
3. For cold-formed metal trusses indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- C. Delegated-Design Submittal:** For cold-formed steel trusses, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data:** For testing agency.

- B. Welding certificates.**

- C. Product Test Reports:** For each listed product, for tests performed by a qualified testing agency.

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Miscellaneous structural clips and accessories.

- D. Field quality-control reports.**

#### **1.5 QUALITY ASSURANCE**

- A. Testing Agency Qualifications:** Qualified according to ASTM E 329 for testing indicated.

- B. Product Tests: Mill certificates or data from a qualified testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel trusses from corrosion, deformation, and other damage during delivery, storage, and handling.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Basis of Design: Subject to compliance with requirements products by the manufacturer listed below:
  - 1. Aegis Metal Framing, a Division of MiTek Industries; 16023 Swingley Ridge Road, Chesterfield, Missouri 63017: [www.aegismetalframing.com](http://www.aegismetalframing.com).
  - 2. Comparable products will be considered only if submitted to and accepted by Architect prior to bidding.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.
  - 1. Design Loads: As indicated on structural drawings.
  - 2. Deflection Limits: Design trusses to withstand design loads without deflections greater than the following:
    - a. Roof Trusses: Vertical deflection of 1/240 of the span for total load, 1/360 of the span total for live load.
  - 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
- C. Cold-Formed Steel Framing Design Standards:
  - 1. Roof Systems: Design according to AISI S210.
  - 2. Lateral Design: Design according to AISI S213.
  - 3. Roof Trusses: Design according to AISI S214.
    - a. Roof Truss designs shall conform to AISI S100, latest edition.



D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

### 2.3 COLD-FORMED STEEL TRUSS MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, structural grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G90 galvanized coating.

### 2.4 ROOF TRUSSES

A. Roof Truss Members: Manufacturer's standard profile steel sections.

1. Connecting Flange Width: 1-5/8 inches, minimum at top and bottom chords connecting to sheathing or other directly fastened construction.
2. Minimum Base-Metal Thickness: 0.0329 inch.
3. Section Properties: As required for performance by SSMA.

### 2.5 ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, structural grade, Type H, metallic coated, of same grade and coating weight used for truss members.

B. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

### 2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and Appendix D in ACI 318, greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Fasteners: Fastener system of type suitable for application, fabricated from corrosion-resistant materials, with capability to sustain, without failure, allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

## 2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Shims: Load bearing, of high-density multimonomer plastic, nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

## 2.8 FABRICATION

A. Fabricate cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate trusses using jigs or templates.

2. Cut truss members by sawing or shearing; do not torch cut.

3. Fasten cold-formed steel truss members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

4. Fasten other materials to cold-formed steel trusses by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace trusses to withstand handling, delivery, and erection stresses. Lift fabricated trusses to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Examine supporting substrates and abutting cold-formed steel trusses for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install, bridge, and brace cold-formed steel trusses according to AISI S200, AISI S214, AISI's "Code of Standard Practice for Cold-Formed Steel Structural Framing," and manufacturer's written instructions unless more stringent requirements are indicated.
  - 1. Install temporary bracing per recommendations in CFBCSI's "Guide to Good Practice for Handling, Installing, Restraining, and Bracing of Cold-Formed Steel Trusses", latest edition.
- B. Install cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened.
  - 1. Fasten cold-formed steel trusses by welding or mechanical fasteners.
    - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings; comply with requirements for spacing, edge distances, and screw penetration.
- C. Install temporary bracing and supports. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- D. Truss Spacing: As indicated.
- E. Do not alter, cut, or remove framing members or connections of trusses.
- F. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.
- G. Erect trusses without damaging framing members or connections.
- H. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings and designed according to CFSEI's TechNote 551e, "Design Guide: Permanent Bracing of Cold-Formed Steel Trusses."
  - 1. Install temporary bracing per recommendations in CFBCSI's "Guide to Good Practice for Installing, Restraining, and Bracing of Cold-Formed Steel Trusses", latest edition.
- I. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Space individual trusses no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### 3.3 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections as indicated on structural drawings.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Field and shop welds will be subject to testing and inspecting.
- D. Prepare test and inspection reports.

### 3.4 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal trusses are without damage or deterioration at time of Substantial Completion.

END OF SECTION 054400 054400

## **SECTION 055000 - METAL FABRICATIONS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Miscellaneous Steel Framing and Supports (055000.A01) for:
  - a. Mechanical and Electrical equipment.
  - b. Steel framing and supports for applications where framing and supports are not specified in other Sections.
2. Shelf angles (055000.A05).
3. Loose bearing and leveling plates (055000.A21) for applications where they are not specified in other Sections.

**B. Products furnished, but not installed, under this Section include the following:**

1. Loose steel lintels (055000.A22).
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

**C. Related Requirements:**

1. Section 012300 "Alternates" for those alternates effecting work of this Section.
2. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
3. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.

#### **1.2 COORDINATION**

- A.** Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B.** Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

#### **1.3 ACTION SUBMITTALS**

**A. Product Data:** For the following:

1. Paint products.

2. Shrinkage-resisting grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
  1. Miscellaneous steel framing and supports.
    - a. Steel framing and supports for mechanical and electrical equipment.
    - b. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  2. Shelf angles.
  3. Loose steel lintels.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.
- B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

#### 1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

#### 1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

#### 1.7 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

### PART 2 PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design the following.
  1. Connections to Building Structure.

- a. Delegated design engineer shall coordinate with structural engineer to design connections to building structure
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Channels, Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- E. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4, and as follows:
  - 1. Size of Channels: 1-5/8 by 1-5/8 inches.
  - 2. Material: Galvanized steel, ASTM A 653/A 653M, with G90 (Z275) coating.

## 2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, (ASTM A563M, Class 10S3) heavy-hex carbon-steel nuts; and where indicated, flat washers.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

- F. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
  - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- H. Slotted-Channel Inserts and Ceiling Assembly: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 1-5/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.
  - 1. Refer to Reflected Ceiling Plans on drawings for locations using this product.

#### 2.4 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer, compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- F. Shrinkage-Resistant Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- G. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

#### 2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.



- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

## 2.6 MISCELLANEOUS FRAMING AND SUPPORTS (055000.A01)

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts for units installed after concrete is placed.
  - 3. Galvanize miscellaneous framing and supports for exterior application and where indicated for interior applications.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger

rods; locate holes where indicated on operable partition Shop Drawings.

- D. Galvanize miscellaneous framing and supports where indicated.
- E. Prime miscellaneous framing and supports with zinc-rich primer, if not exposed to view; or primer specified in Section 099600 "High-Performance Coatings" where exposed to view or painted.

#### 2.7 SHELF ANGLES (055000.A05)

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
  - 1. Provide mitered and welded units at corners.
  - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize shelf angles located in exterior walls.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

#### 2.8 MISCELLANEOUS STEEL TRIM (055000.A13)

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
  - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize exterior miscellaneous steel trim.
- D. Prime miscellaneous steel trim with zinc-rich primer, if not exposed to view; or primer specified in Section 099600 "High-Performance Coatings" where exposed to view or painted.

#### 2.9 LOOSE BEARING AND LEVELING PLATES (055000.A21)

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.
- C. Prime plates with zinc-rich primer.

#### 2.10 LOOSE STEEL LINTELS (055000.A22)

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer, if not exposed to view; or primer specified in Section 099600 "High-Performance Coatings" where exposed to view or painted.

#### 2.11 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

#### 2.12 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

#### 2.13 STEEL FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel hardware and with ASTM A 123/A 123M for other steel products.
  - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
  - 1. Shop prime with universal shop primer unless zinc-rich primer is indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
  - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## PART 3 EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
  - 1. Cast Aluminum: Heavy coat of bituminous paint.
  - 2. Extruded Aluminum: Two coats of clear lacquer.
- G. Connect downspout boots to downspouts and to subdrainage system vertical risers as recommended by boot manufacturer.

### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions and overhead doors securely to, and rigidly brace from, building structure.

### 3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000



## **SECTION 061000 - ROUGH CARPENTRY**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

##### **A. Section Includes:**

1. Miscellaneous framing with dimension lumber (061000.A01).
2. Wood blocking, cants, and nailers (061000.A13)
3. Preservative-treated wood blocking, cants and nailers (061000.A12).
4. Wood furring and grounds (061000.A15, 061000.A18).
5. Plywood blocking panels (061000.A19).
6. Fire retardant treated plywood blocking and backing panels (061000.A20).
7. Preservative-treated plywood blocking panels (061000.A22)
8. Flexible Strip Flashing (061000.A24).

##### **B. Related Requirements:**

1. Section 012300 "Alternates" for those alternates effecting work of this Section.
2. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.

#### **1.2 DEFINITIONS**

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NLGA: National Lumber Grades Authority.
  2. SPIB: The Southern Pine Inspection Bureau.
  3. WCLIB: West Coast Lumber Inspection Bureau.
  4. WWPA: Western Wood Products Association.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
  2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials

based on testing by a qualified independent testing agency.

3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

#### 1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Expansion anchors and metal framing anchors.

#### 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
- B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

### PART 2 PRODUCTS

#### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.



2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness unless otherwise indicated.

## 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWWA U1; Use Category UC2[ for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground].
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
  2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
  3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
  4. Wood floor plates that are installed over concrete slabs-on-grade.

## 2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
  2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
  3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
  4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841. For enclosed roof framing, framing in attic spaces, and where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat items indicated on Drawings, and the following:
1. Plywood blocking and backing panels.

#### 2.4 DIMENSION LUMBER FRAMING

- A. Miscellaneous Framing (061000.A01): No. 2 grade.
1. Species:
    - a. Hem-fir (north); NLGA.
    - b. Mixed southern pine; SPIB.
    - c. Douglas fir-larch; WCLIB or WWPA.
  2. Refer to Article 2.2 and Article 2.3 for locations of preservative treated wood and fire retardant treated wood.

#### 2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Preservative-treated blocking, grounds and nailers (061000.A12).
  2. Blocking, grounds and nailers (061000.A13).
    - a. Blocking for wall-mounted cabinets and casework shall be 2x6, minimum.
  3. Curbs and cants (061000.A14).
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
1. Mixed southern pine or southern pine; SPIB.
  2. Spruce-pine-fir; NLGA.

3. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
  4. Western woods; WCLIB or WWPA.
- C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
  2. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
  3. Western woods; WCLIB or WWPA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

## 2.6 MISCELLANEOUS PLYWOOD PANELS

- A. General: DOC PS 1, Exposure 1, CD, non-fire-retardant treated and fire-retardant treated as noted below, in thickness indicated or, if not indicated, not less than 5/8-inch nominal thickness.
1. Plywood blocking and backing panels, non-fire-retardant treated (061000.A19).
  2. Fire-Retardant-Treated Plywood blocking and backing panels (061000.A20).
    - a. Note that plywood equipment backing panels are specified in Article below.
  3. Preservative Treated Plywood blocking and backing panels, non-fire-retardant treated (061000.A22).

## 2.7 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels (061000.A20): Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

## 2.8 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
  2. Where rough carpentry is preservative treated or fire-retardant-treated wood materials, provide Type 304 stainless steel fasteners or fasteners with corrosion-protective coating have a salt-spray resistance of more than 800 hours according to ASTM B117.
- B. Nails, Brads, and Staples: ASTM F 1667.

- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.
  - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
  - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

## 2.9 MISCELLANEOUS MATERIALS

- A. Flexible Strip Flashing (061000.A24): Provide self-adhering, membrane, 40 mils thick.
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work included, but are not limited to, the following:
    - a. Air-Shield by W. R. Meadows, Inc.
    - b. Blueskin by Henry Corp.
    - c. CCW 705 by Carlisle Coatings & Waterproofing.
    - d. Hyload S/A Through Wall Flashing by Hyload, Inc.
- B. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
  - 1. Adhesives shall have a VOC content of 70 g/L or less.
- C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

## PART 3 EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood blocking and backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
1. Use inorganic boron for items that are continuously protected from liquid water.
  2. Use copper naphthenate for items not continuously protected from liquid water.
- H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. NES NER-272 for power-driven fasteners.
  2. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code.
  3. ICC-ES evaluation report for fastener.
- J. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- K. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
1. Comply with approved fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
  2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

### 3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

### 3.3 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

## **SECTION 061600 - SHEATHING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Preservative-treated plywood sheathing (061600.A01).
2. Plywood wall sheathing (061600.A03).
3. Underlayment (061600.A12).
4. Miscellaneous sheathing as indicated for backup to sheet metal flashing, coping, and other applications indicated.

**B. Related Requirements:**

1. Section 012300 "Alternates" for those alternates affecting work of this Section.
2. Section 061000 "Rough Carpentry" for plywood backing panels.
3. Section 072500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.
4. Section 072729 "Air-Barrier Coatings" for air barrier applied over wall sheathing.

#### **1.2 ACTION SUBMITTALS**

**A. Product Data:** For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
  - a. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

#### **1.3 INFORMATIONAL SUBMITTALS**

**A. Evaluation Reports:** For the following, from ICC-ES:

1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

### PART 2 PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

#### 2.2 WOOD PANEL PRODUCTS - GENERAL

- A. Plywood: DOC PS1.
  - 1. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
  - 2. Factory mark panels to indicate compliance with applicable standard.

#### 2.3 WOOD-PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWWA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
  - 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
  - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete, plywood used with roofing, coping, flashing, vapor barriers, and waterproofing.

#### 2.4 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as



determined by testing identical products per test method indicated by a qualified testing agency.

- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
  - 1. Use treatment that does not promote corrosion of metal fasteners.
  - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
  - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.
  - 4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D5516 and design value adjustment factors shall be calculated according to ASTM D6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F (76 deg C) shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat plywood indicated on Drawings, and the following:
  - 1. Wall sheathing.
  - 2. Back side of parapets where indicated.

## 2.5 WALL SHEATHING

- A. Preservative-treated plywood sheathing (061600.A01).
  - 1. Span Rating: Not less than 16/0.
  - 2. Nominal Thickness: Unless specifically indicated otherwise, not less than 5/8 inch.
  - 3. Size: 48 by 96 inches or as required for vertical installation without butt joints.
- B. Plywood Wall Sheathing: (061600.A03)
  - 1. Span Rating: Not less than 16/0.
  - 2. Nominal Thickness: Not less than 5/8 inch.
  - 3. Size: 48 by 96 inches or as required for vertical installation without butt joints.
  - 4. Locations: Where specifically indicated.

## 2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. For roof and parapet sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
  - 2. For wall sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Sheathing to Wood Framing: ASTM C 1002.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

## PART 3 EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
  - 2. ICC-ES evaluation report for fastener.
- D. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

### 3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall Sheathing:

- a. Screw to cold-formed metal framing.
- b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 061600



## **SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes self-adhering modified bituminous sheet waterproofing system (071326.A01) as follows:
  - 1. Moisture barrier (071326.A08).
- B. Related Requirements:
  - 1. Section 012300 "Alternates" for those alternates related to work of this Section.
  - 2. Section 042000 "Unit Masonry" for installation of moisture barriers in unit masonry.

#### **1.2 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site concurrently with masonry preinstallation conference.
  - 1. Review moisture barrier requirements including, but not limited to, the following:
    - a. Surface preparation specified in other Sections.
    - b. Substrate condition and pretreatment.
    - c. Forecasted weather conditions.
    - d. Special details and sheet flashings.
    - e. Installation procedures.
    - f. Field quality control.
    - g. Protection.
    - h. Repairs.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, and tested physical and performance properties of moisture barrier.
  - 2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.
- B. Shop Drawings:
  - 1. Show locations and extent of moisture barrier.
  - 2. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining moisture barrier, and other termination conditions.
- C. Samples: For each exposed product and for each color and texture specified, including the following products:
  - 1. Moisture barrier, 8 inches by 8 inches.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For Installer.
- B. Field quality-control reports.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by moisture barrier manufacturer.

## 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Apply moisture barrier within the range of ambient and substrate temperatures recommended in writing by moisture barrier manufacturer. Do not apply moisture barrier to a damp or wet substrate.

- 1. Do not apply moisture barrier in snow, rain, fog, or mist.

- B. Maintain adequate ventilation during preparation and application of moisture barrier materials.

## 1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement moisture barrier material for moisture barrier that does not comply with requirements or that fails to remain watertight within specified warranty period.

- 1. Warranty Period: Three years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Moisture Barrier: Obtain moisture barrier materials from single source and single manufacturer.

### 2.2 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by moisture barrier manufacturer for intended use and compatible with sheet waterproofing.

- 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

- B. Primer and Surface Conditioner: Liquid waterborne primers and surface conditioners recommended for substrate by moisture barrier material manufacturer.

- C. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

### 2.3 MOISTURE BARRIER (071326.A08)

- A. Rubberized-Asphalt Moisture Barrier: Composite product consisting of a pliable, adhesive 32 mil rubberized-asphalt compound, bonded to a high-density, 8 mil cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.

- 1. Basis-of-Design Products: Subject to compliance with requirements, provide one of the following:

- a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
    - b. Grace Construction Products, W.R. Grace & Co. – Conn.; Perm-A-Barrier wall flashing.

- 2. Application: Unless otherwise indicated, use the following:

- a. Moisture barrier at base of wall from footing to 8 inches above horizontal leg of through wall flashing elevation.
- 3. Primers and Mastic: Manufacturer's standard products or product recommended by moisture barrier flashing manufacturer for bonding sheets to substrates and as follows:
  - a. Solvent based primer for bonding flexible moisture barrier to substrates.
    - 1) Liquid applied with roller or brush.
    - 2) Spray adhesive recommended by manufacturer.
      - (a) Basis of Design: Carlisle Coatings and Waterproofing: Travel-Tack and Cav-Grip.
- 4. Metal Termination Bars (071326.A02): Flat, aluminum bars, 1 tall by not less than 14 gage thick, predrilled at 6 to 9-inch centers.
  - a. Basis-of-Design Products: Subject to compliance with requirements, provide one of the following:
    - 1) Hechman Building Products; Model 1050A140.
    - 2) Hohmann and Barnard; Model T1 Term Bar.
    - 3) Wire-Bond; Model #4200 Term Bar.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of work of this Section.
  - 1. Verify that concrete has cured and aged for minimum time period recommended in writing by moisture barrier manufacturer.
  - 2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer.
    - Test for capillary moisture by plastic sheet method according to ASTM D4263.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Clean, prepare, and treat substrates according to moisture barrier manufacturer's written instructions. Provide clean, dust-free, and dry substrates for moisture barrier application.
- B. Mask off adjoining surfaces not receiving moisture barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D4258.
  - 1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.
- F. Bridge and cover isolation joints, expansion joints, and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.
- G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D6135.
1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:
    - a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.
- H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through moisture barrier as recommended by manufacturer.

### 3.3 INSTALLATION OF MOISTURE BARRIER

- A. General: Comply with manufacturer's recommendations for preparation of surfaces and installation of moisture barrier and as follows:
1. Prepare surfaces so they are smooth and free from projections that could puncture moisture barrier.
  2. Prime CMU wall surface then install moisture barrier.
  3. Install moisture barrier horizontally in longest lengths practical to minimize lap joints.
  4. Roll entire surface then seal all lap seams with mastic.
  5. Anchor top of moisture barrier to wall substrate with flat termination bar securely fastened to wall substrate.
  6. Schedule work so moisture barrier is not exposed to UV more than 30 days or protect from UV.

### 3.4 PROTECTION, REPAIR, AND CLEANING

- A. Protect moisture barrier from damage and wear during remainder of construction period.
- B. Correct deficiencies in or remove moisture barrier that does not comply with requirements; repair substrates, reapply moisture barrier, and repair sheet flashings.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071326



## **SECTION 072100 - THERMAL INSULATION**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

##### **A. Section Includes:**

1. Extruded polystyrene rigid insulation board (072100.A01)
  - a. Foundation perimeter insulation.
    - 1) Refer to Section 033000 for installation and product information.
  - b. Cavity wall insulation below base flashing (through wall flashing).
    - 1) Refer to Section 042000 for installation requirements.
2. Polyisocyanurate foam-plastic board (072100.A04).
3. Mineral-wool blanket (072100.A17).
4. Spray polyurethane foam insulation (072100.A12).

##### **B. Related Requirements:**

1. Section 033000 "Cast-in-Place Concrete" for foundation insulation and foam void fill.
2. Section 075216 "Modified Bituminous Membrane Roofing" for roof insulation.
3. Section 078446 "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.
4. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

##### **C. Products Furnished but not Installed Under Work of this Section:**

1. Cavity-wall insulation.

#### **1.2 PREINSTALLATION MEETINGS**

- ##### **A. Preinstallation Conference:** Conduct conference at Project site.

#### **1.3 ACTION SUBMITTALS**

- ##### **A. Product Data:** For each type of product.

#### **1.4 INFORMATIONAL SUBMITTALS**

- ##### **A. Product Test Reports:** For each product, for tests performed by a qualified testing agency.
- ##### **B. Evaluation Reports:** For foam-plastic insulation, from ICC-ES.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- ##### **A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.**
- ##### **B. Protect foam-plastic board insulation as follows:**
1. Do not expose to sunlight except to necessary extent for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

## PART 2 PRODUCTS

### 2.1 EXTRUDED POLYSTYRENE FOUNDATION PERIMETER INSULATION (072100.A01)

- A. Refer to Section 033000 "Cast-in-Place Concrete" for product information and installation.

### 2.2 POLYISOCYANURATE FOAM-PLASTIC BOARD

- A. Polyisocyanurate Board, Glass-Fiber-Mat Faced (072100.A04): ASTM C 1289, glass-fiber-mat faced, Type II, Class 2, Grade 2. Facers shall be coated.

1. Locations:

- a. Cavity wall insulation

2. Thicknesses:

- a. Cavity wall applications, 2 inches thick, unless otherwise indicated.

3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

4. Insulation, associated components and adhesives shall be compatible with fluid-applied air barrier coating specified in Section 072726.

5. Manufacturers and Products: Subject to compliance with requirements, provide one of the following products:

- a. Carlisle Coatings and Waterproofing; "R2+ Matte."
- b. Firestone Building Products; "Enverge CI."
- c. Hunter; "Xci CG".
- d. Atlas; comparable product submitted to and accepted by Architect prior to bidding.

### 2.3 MINERAL-WOOL INSULATION

- A. Sustainability Requirements: Provide mineral wool insulation as follows:

1. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

- B. Mineral-Wool Blanket, Unfaced (072100.A17): ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Thickness: As indicated.

- C. Pre-manufactured Head-of-Wall Mineral Wool Insulation: Meeting same criteria as specified above; manufactured into various shapes and sizes to fill voids between top-of-wall and metal decking.

### 2.4 SPRAY POLYURETHANE FOAM INSULATION

- A. Closed-Cell Polyurethane Foam Insulation (072100.A12): ASTM C1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450 respectively, per ASTM E84.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. BASF Corporation
- b. Dow Chemical Company (The)
- c. NCFI; Division of Barnhardt Mfg. Co.
- d. Icynene "ProSeal".
- e. Demilec; "Heatlok XT High Lift".

2. Minimum density of 1.5 lb/cu. ft., thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg. F.

B. Intumescent Coating over Foam Insulation:

1. Basis of Design: Subject to requirements, provide "DC315 Intumescent Coating" by International Fireproof Technology Inc. or a comparable product submitted to and accepted by Architect prior to bidding.
2. Product must be tested to the criteria of NFPA 286 or UL1715 for a duration of 15-20 minutes by an accredited fire testing facility.

## 2.5 ACCESSORIES

- A. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
  2. Adhesives shall be compatible with fluid-applied air barrier coating specified in Section 072729.
  3. Adhesives shall have a VOC content of 70 g/L or less.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

### 3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer
- C. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  - 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- D. Mineral-Wool Blanket Insulation: Install at tops of non-rated interior walls to fill cavities between top of wall and underside of deck/structure above. Install in parapet walls over runner track as shown. Provide lengths that will produce a snug fit between ends.
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- E. Spray-Applied Insulation at Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
  - 1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
  - 2. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of CMU by using method recommended by insulation manufacturer.
  - 3. Fill voids of joist bearing pockets in exterior walls.

4. Fill voids between double studs at openings in exterior walls.
5. Fill voids between framing members of boxed headers, including header.
6. Fill voids at tops of exterior walls or provide pre-manufactured head-of-wall mineral wool insulation.
7. At raised Platform between framing members for sound deadening.
8. Apply intumescent fireproofing coating over spray applied insulation as recommended by manufacturers of both systems.

#### 3.4 INSTALLATION OF CAVITY-WALL INSULATION

- A. Refer to Section 042000 "Unit Masonry" for additional installation requirements.

#### 3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.  
Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100



## **SECTION 072500 - WEATHER BARRIERS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Self-adhering building wrap/weather barrier.

#### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. For self-adhering building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.
- B. Shop Drawings: For weather-barrier assemblies.
  - 1. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

#### **1.3 INFORMATIONAL SUBMITTALS**

- A. Evaluation Reports: For water-resistive barrier, from ICC-ES.
  - 1. Weather resistive barrier shall meet ICC-ES AC308 "Acceptance Criteria for Water Resistive Barriers".

#### **1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

### **PART 2 PRODUCTS**

#### **2.1 WATER-RESISTIVE BARRIER (072500.A02).**

- A. Basis-of-Design Products: Provide weather resistive barrier as a complete system, including but not limited to; self-adhering building wrap, self-adhering flashing, reinforced liquid flashing, tape and sealants. Subject to compliance with requirements, provide one of the following:
  - 1. Henry Company; "BlueskinVP 160".
  - 2. Cosella-Dorcken; "Delta-Vent SA".
  - 3. Comparable substitute meeting specified requirements, and which is submitted to and accepted by Architect prior to bidding.
- B. Performance Characteristics:
  - 1. Water-Vapor Permeance: Not less than 29 perms per ASTM E 96/E 96M, Method B.
  - 2. Air Leakage: Not greater than 0.004 CFM/sqft at 1.57 lbs/sqft when tested in accordance with ASTM E2178.
  - 3. Thickness shall not be less than 0.023 inches.

4. Allowable UV Exposure Time: Not less than three months.
5. Fire Performance Characteristics: Class A when tested in accordance with ASTM E 84.

## 2.2 MISCELLANEOUS MATERIALS

- A. General: Accessory materials recommended by weather-barrier manufacturer to produce a complete assembly and compatible with primary weather-barrier material
- B. Flexible Flashing: Weather resistive barrier manufacturer's standard composite, self-adhesive, flashing product.
- C. Liquid Flashing: Weather resistive barrier manufacturer's standard composite, liquid flashing and reinforcing mesh.
- D. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.
- E. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

## PART 3 EXECUTION

### 3.1 EXAMINATION AND SURFACE PREPARATION

- A. General: Examine and prepare surfaces to receive self-adhering building wrap/weather barrier in strict accordance with barrier manufacturer's written instructions, and as follows:
  1. All surfaces must be dry, sound, clean and free of oil, grease, dirt, excess mortar and other contaminants detrimental to adhesion of barrier membrane and flashings.
  2. Remove fins, ridges, mortar, and other projections.
  3. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

### 3.2 WATER-RESISTIVE BARRIER INSTALLATION

- A. General: Install weather-barrier and accessory materials according to manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous weather barrier.
  1. Apply flashing (liquid and membrane types) to comply with manufacturer's written instructions.
- B. Where recommended by weather barrier manufacturer, apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
  1. Where indicated, cover exposed exterior surface of sheathing indicated to receive metal fascia with water-resistive barrier securely adhered to sheathing as occurs. Stagger all end lap seams.
- C. Cover sheathing with water-resistive barrier as follows:
  1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
  2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap.



3. Lap over adjacent construction and adhere to substrate. Cut back weather resistive barrier so it will not be exposed to view and will allow for edge of barrier to be covered with sealant.
  4. Install weather barrier and auxiliary materials to lap and seal to adjacent waterproofing and air barrier coating as occurs, to provide continuity of building envelope barrier
- D. At end of each working day, seal top edge of weather barrier to substrate with termination mastic.
- E. Openings: Prime concealed, perimeter frame surfaces of windows, storefronts, and doors. Apply transitions and flashing (liquid or membrane) so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.
- F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of weather-barrier material with flexible low-rise foam sealant.
- G. Seal top of through-wall flashings to weather barrier. Provide termination bar as recommended by weather barrier manufacturer.
- H. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- I. Repair punctures, voids, and deficient lapped seams. Slit and flatten fishmouths and blisters. Extend patches 6 inches beyond repaired areas.
- J. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

### 3.3 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
1. Prime substrates as recommended by flashing manufacturer.
  2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
  3. Lap flashing over water-resistive barrier at bottom and sides of openings.
  4. Lap water-resistive barrier over flashing at heads of openings.
  5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 072500



## **SECTION 072729 - FLUID APPLIED AIR BARRIER COATINGS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section includes:**

1. Vapor-retarding, fluid-applied air barriers (072726.A01).
2. Transition (Detail) Membrane (072726.A03).

**B. Related Requirements:**

1. Section 042000 "Unit Masonry" for masonry to receive air barriers.
2. Section 061600 "Sheathing" for wall sheathing to receive air barriers.
3. Section 076200 "Sheet Metal Flashing and Trim" for flexible membrane closures installed with air barriers.

#### **1.2 DEFINITIONS**

- A. Air-Barrier Material:** A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory:** A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly:** The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

#### **1.3 PREINSTALLATION MEETINGS**

**A. Pre-Installation Conference:** Conduct conference at Project site.

1. Contractor to organize and convene conference a minimum of two weeks prior to commencing Work of this Section.
2. Agenda shall include, at a minimum, the following:
  - a. Construction and visual inspection of mock-up.
  - b. Sequence of construction.
  - c. Coordination with substrate preparation.
  - d. Materials approved for use.
  - e. Compatibility of materials.
  - f. Coordination with installation of adjacent and covering materials.
  - g. Details of construction.
  - h. Review of inspection, testing, protection and repair procedures
  - i. Construction site safety will be discussed to review hazards or fire risks during application.
3. Attendance is required by air barrier coating manufacturer's representative, air barrier coating installer, representatives of related trades including covering materials, substrate materials and adjacent materials.

#### **1.4 ACTION SUBMITTALS**

**A. Product Data:** For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; tested physical and performance properties of products.

2. Include verification data, including graphic illustrations, listing each component of the assembly passing NFPA 285 testing.
3. Submit product data for air barrier coatings concurrently with product data for polyisocyanurate insulation.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air barrier. Include details for each type of substrate showing: substrate joints and cracks, through-wall flashing, counterflashing, each type of penetration, inside and outside corners, terminations, expansion joints, air barrier flashing system at openings and tie-ins with adjoining construction.
2. Include details of interfaces with other materials that form part of air barrier.
3. Show and list each component of the assembly.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Include list of manufacturer-certified installers and supervisors employed by the Installer, who work on Project, in addition to the following:
1. Submit in writing, evidence of experience.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
- C. Product test reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified for ASTM E2178.

### 1.6 QUALITY ASSURANCE

- A. Manufacturer: Air barrier systems shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of waterproofing. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer, in addition to the following:
1. Installer shall have not less than 5 years successful experience, under the current company name, in installing fluid-applied membrane air barriers of similar type, size and complexity as those specified for this Project.
  2. Installer shall submit a reference list, complete with Owner, Architect, General Contractor or Construction Manager; phone number of each, of at least seven (7) completed projects in the states of Missouri and Kansas similar in size and specification.
    - a. List shall include square footage installed on each project.
    - b. List shall include type of air barrier installed, name of product installed and name of manufacturer.

3. Installer shall assign experienced mechanics from previous applications, including lead mechanic/supervisor, for this Project.
- C. Field Mockups: Build mockups to set quality standards for materials and execution.
1. Apply air barrier coating to mockup panels specified in Section 042000 "Unit Masonry", to demonstrate surface preparation, crack and joint treatment, application of air barriers and associated flashing and transitions, and sealing of gaps, terminations, ties-ins and terminations at openings, and penetrations of air-barrier assembly.
  2. Coordinate application to mockups to permit inspection by Architect and air barrier coating manufacturer's representative of air barrier before external insulation and cladding are installed.
    - a. Include junction building corner condition, building expansion joint and sheet metal flashing.
  3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- D. Testing Agency: Contractor shall engage an independent testing agency to perform testing as indicated in the work of this Section.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.
- C. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
- D. Do not double-stack pallets of fluid applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
- E. Protect fluid-applied membrane components from freezing and extreme heat.
- F. Sequence deliveries to avoid delays but minimize on-site storage.

#### 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
  1. Protect substrates from environmental conditions that affect air-barrier performance.
  2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.
  3. Do not apply product or accessories over incompatible materials.

## 1.9 WARRANTY

- A. Material Warranty: Manufacturer's standard form in which manufacturer agrees to replace fluid-applied air barrier membrane materials that fail within specified warranty period when installed and used in strict conformance with written manufacturer's instructions.
1. Failures for non-permeable air barrier system include, but are not limited to, the following:
    - a. Failure to maintain air permeance rating not to exceed 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178, within specified warranty period.
    - b. Failure to maintain a vapor permeance rating no greater than 1 perms when tested in accordance with ATM E96, Method B.
  2. Failures for permeable air barrier system include, but are not limited to, the following:
    - a. Failure to maintain air permeance rating not to exceed 0.02 L/s/sq. m. when tested per ASTM E2178, within specified warranty period.
    - b. Failure to maintain a vapor permeance rating greater than 10 perms when tested in accordance with ATM E96, Method B.
  3. Warranty Period: Five years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.1 MATERIALS – GENERAL

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.
1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- B. VOC Content: 100 g/L or less.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Vapor Retarding Fluid-Applied Air Barrier - General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.
- C. Exterior wall assemblies incorporating the product and accessories shall be tested in accordance with and comply with the acceptance criteria of NFPA 285.
- D. Air barrier system shall be tested for various fastener attached penetrations including, but not limited to, veneer anchors.
- E. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:

1. Foundation and walls.
2. Walls and windows or doors.
3. Different wall systems.
4. Wall and roof.
5. Wall and roof over unconditioned space.
6. Walls, floor and roof across construction, control and expansion joints.
7. Walls, floors and roof to utility, pipe and duct penetrations.

F. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

### 2.3 VAPOR-RETARDING FLUID-APPLIED AIR BARRIER

A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier (072729.A01): Fire-resistant, synthetic polymer membrane.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Carlisle Coatings and Waterproofing (CCW); "Fire-Resist BarriTech NP."
  - b. Henry Corporation; "Air-Bloc 32 MR."
  - c. W. R. Meadows; "Air-Shield LSR."
  - d. Tremco; "ExoAir 130."
  - e. Comparable products from other manufacturers meeting specified requirements, and that are submitted to and accepted by Architect prior to bidding.
2. Physical and Performance Properties:
  - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
  - b. Water Vapor Permeance: Maximum 1 perm; ASTM E 96/E 96M (Method B).
  - c. Ultimate Elongation: Minimum 346 percent; ASTM D412, Die C.
  - d. Surface Burning Characteristics:
    - 1) Flame Spread Index of 25 or less; ASTM E 84.
    - 2) Smoke Generation Index of 450 or less; ASTM E 84.
  - e. Low Temperature Flexibility: No cracking at minus 20 degrees F, 180 degree bend over 1-inch mandrel.
  - f. Fastener Sealability: No water leaking through nail penetration after 24 hours; ASTM D 1970.
    - 1) System shall be coordinated and tested with installation requirements of veneer anchors and other attachments over air barrier system.
  - g. UV Exposure Rating: Coating may be exposed up to 180 days (6 months) without effecting warranty.
  - h. Multi-Story Fire Tests: Air barrier coating shall pass NFPA 285.

### 2.4 ACCESSORY MATERIALS

- A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete fire-resistant air-barrier assembly and compatible with primary air-barrier material.
- B. Transition Membrane and Flashing (072729.A03): Provide self-adhering sheet or reinforced liquid flashing as recommended by air-barrier material manufacturer. Approved with air barrier membrane in NFPA 285 wall assemblies.
  1. Basis-of-Design Products for Transition Membrane: Subject to compliance with requirements, provide one of the following:

- a. Carlisle Coatings and Waterproofing; "CCW Sure-Seal Pressure-Sensitive Elastoform".
  - b. Comparable products from other manufacturers listed.
  - c. Comparable products from other manufacturers not listed, meeting specified requirements, submitted to and accepted by Architect prior to bidding.
2. Basis-of-Design Products for Detail Flashing: Subject to compliance with requirements, provide one of the following:
- a. Carlisle Coatings and Waterproofing; "Fire-Resist 705 FR-A."
  - b. Comparable products from other manufacturers listed.
  - c. Comparable products from other manufacturers not listed, meeting specified requirements, submitted to and accepted by Architect prior to bidding.
- C. Contact Adhesive: As approved by air-barrier manufacturer.
- D. Primer: Liquid primer as approved by air-barrier manufacturer for substrates involved.
- E. Detail Mastic: As approved by air-barrier manufacturer.
- F. Joint Reinforcing Fabric: Air-barrier manufacturer's woven, synthetic polymer reinforcement fabric.
- G. Joint Reinforcing Strip: Air-barrier manufacturer's self-adhering glass-fiber-mesh tape.
- H. Glass Mat: Randomly-oriented glass strands held in binder soluble in wet air barrier membrane.
- 1. As approved by air-barrier manufacturer.
- I. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- J. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.
- K. Sprayed Polyurethane Foam Sealant: Class 1, one- or two-component, disposable, closed-cell, low-pressure spray foam insulation/sealant kits. Spray foam shall be flame retardant and have a nominal 2.0-lb/cu. ft density; 95 percent minimum closed cell content and shall meet ASTM E 84 requirements flame-spread index of 25 or less and a smoke developed rating of 300 or less based on 2 inch thickness. Provide insulation manufacturer's recommended primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- L. Joint Sealant:
- 1. Dow 790, 791, 795.
  - 2. Pecora 890, 891, 895.
  - 3. GE Silpruf, Silpruf LM.
  - 4. Other product approved by air barrier membrane manufacturer.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
  - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.



2. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
  3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263. Honeycomb and holes/cracks exceeding ¼ inch across shall be filled with grout or mortar.
  4. Verify that masonry joints are flush and completely filled with mortar.
  5. Verify that wall assemblies are dried in, such that water intrusion will not occur from above, behind or around the air barrier installation.
  6. Surfaces shall be supported and flush at joints without large voids or sharp protrusions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 SURFACE PREPARATION

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied air barrier system.
- B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat all screws with liquid flash to ensure recessed screws holes are filled. Gaps greater than 6mm (1/4 in.) should be filled with mastic or caulk, allowing sufficient time to fully cure before application of the tape and fluid applied air barrier system.
- C. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.
- D. Clean, prepare, treat, and seal substrate and substrate joints according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.
- E. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- F. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- G. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.
- H. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- I. Fill cracks, gaps and joints exceeding ¼ inch width with fill compound or sealant approved by air barrier manufacturer. Fill rough gaps around pipe, conduit and similar penetrations with mortar, non-shrink grout, fill compound or polyurethane foam sealant shaved flush.

- J. At changes in substrate plane, apply sealant or termination mastic beads to create a cant at sharp corners and edges to form a smooth transition from one plane to another.
- K. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

### 3.3 JOINT TREATMENT

- A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.
  - 1. Prime substrate and apply a single thickness of air-barrier manufacturer's recommended preparation coat extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of air-barrier coating material and embed joint reinforcing in preparation coat.
- B. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions. Apply first layer of air-barrier coating material at joints. Tape joints with joint reinforcing after first layer is dry. Apply a second layer of air-barrier coating material over joint reinforcing.
- C. Plywood Sheathing: Fill joints and apply air-barrier coating in strict accordance with air-barrier coating manufacturer's written instructions to suit substrate involved.

### 3.4 TRANSITION STRIP AND FLASHING INSTALLATION

- A. General: Install strips, transition strips, flashing, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
  - 1. Coordinate the installation of air barrier with installation of sheet metal flashing and embedded masonry through-wall flashing to ensure continuity of air barrier and drainage to exterior.
  - 2. Install transition strip between changes in substrates and base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
  - 3. Vertical legs of metal flashings installed over fluid applied air barrier coatings shall receive transition strips and fluid applied flashings, installed as recommended by manufacturers written recommendations.
- B. Apply primer to substrates, when required by air barrier coating manufacturer, at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier coating material on same day. Re-prime areas exposed for more than 24 hours.
  - 1. Prime glass-fiber-surfaced gypsum and plywood sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
  - 2. Where required by air barrier coating manufacturer to achieve performance specified, apply manufacturer's recommended filler coat over CMU and similar substrates.

- C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials. Extend flashing/transition membrane into window and other openings to completely cover wood blocking and nailers in accordance with air barrier coating manufacturer's recommendations and approved shop drawings.
- D. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- E. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- F. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- H. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

### 3.5 INSTALLATION

- A. General: Install fluid-applied membrane air-barriers and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier/moisture barrier. Apply air-barrier coating within manufacturer's recommended application temperature ranges.
  - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier.
  - 2. Coordinate the installation of air barrier with installation of weather barrier and jamb closure membranes to ensure compatibility and continuation of barriers to allow water to drain to exterior.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
  - 1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Vapor Retarding Fluid-Applied Membrane Material: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.
  - 1. Vapor-Retarding Membrane Air Barrier: Total dry film thickness as recommended in writing by air barrier manufacturer to meet performance requirements specified and as listed in Air Barrier Association of

- America (ABAA) for air permeance and water vapor permeance (desiccant method), but not less than 40-mil dry film thickness.
- a. Apply additional coats as needed to achieve void- and pinhole-free surface.
2. Extend system into window and door openings of metal-stud-framed walls.
- D. Apply strip and transition strip a minimum of 1 inch onto cured air-barrier material or strip and transition strip over cured air-barrier material overlapping 3 inches onto each surface according to air-barrier manufacturer's written instructions.
  - E. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
  - F. Repair punctures, voids, and deficient lapped seams. Slit and flatten fishmouths and blisters. Extend patches 6 inches beyond repaired areas, unless otherwise recommended by air barrier manufacturer.
  - G. Do not cover air barrier until it has been inspected by air barrier coating manufacturer's representative and installation has been reviewed and accepted by Architect.
  - H. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

### 3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Air barrier coating manufacturer shall perform tests and inspections.
- B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include, and is not limited to, the following:
  1. Continuity of air-barrier system has been achieved with no gaps or holes.
  2. Continuous support of air-barrier system has been provided.
  3. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
  4. Termination mastic has been applied on cut edges.
  5. Flashing strips, transition strips and liquid flashing have been firmly adhered to substrate.
  6. Compatible materials have been used.
  7. Transitions at changes in direction and structural support at gaps have been provided.
  8. All penetrations have been sealed.
- C. Tests: As determined by air barrier coating manufacturer's representative from among the following tests:
  1. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. according to ASTM D 4541 for each 1000 sq. ft. of installed air barrier or part thereof.
- D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
  2. Remove and replace deficient air-barrier components for retesting as specified above.
- E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- F. Prepare test and inspection reports.

### 3.7 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
  2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- C. Remove masking materials after installation.

END OF SECTION 072729



## **SECTION 074213 - FORMED METAL WALL AND SOFFIT PANELS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Concealed-fastener, lap-seam metal wall panels (074213.A03).
2. Concealed-fastener, lap-seam metal soffit panels (074213.A05).

**B. Related Sections:**

1. Section 054000 "Cold-Formed Metal Framing" for miscellaneous support framing.

#### **1.2 PREINSTALLATION MEETINGS**

**A. Preinstallation Conference: Conduct conference at Project site.**

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel assembly during and after installation.
8. Review of procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### **1.3 ACTION SUBMITTALS**

**A. Product Data: For each type of product.**

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

**B. Shop Drawings:**

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, locations and types of sealants, and accessories; and special details. Show locations of all cutouts.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
  - a. Indicate flashing and trim to be provided under work of this Section and to be provided by others.
  - b. Indicate shape and method of attachment.
  - c. Anchorage systems. Show locations for any exposed fasteners.
  - d. Sealants: Indicate locations and types for factory-applied and field-installed sealants.
- C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.
  1. Include Samples of trim and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish and panel type required, prepared on Samples of size indicated below.
  1. Metal Wall Panels: 6 to 12 inches long by actual panel width for each color. Include fasteners, closures, and other metal wall panel accessories.
  2. Metal Soffit Panels: 6 to 12 inches long by actual panel width for each color. Include fasteners, closures, and other metal wall panel accessories.
  3. Trim and Closures: 6 to 12 inches in length for each trim profile. Include fasteners and other exposed accessories.
  4. Accessories: 6 to 12-inch-long Samples for each type of accessory.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.
- B. Sample Warranties: For special warranties.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have a minimum of five (5) years of experience in production of metal panels similar in design to those specified.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer, with not less than seven (7) years of successful experience under the current company name installing metal panels similar to those required for this Project.
- C. Integrated Field Sample: Build field sample of wall panles to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.



1. Build integrated field sample of typical wall panel area as shown on Drawings, including furring system, insulation, supports, attachments, trim, and accessories.
  - a. Field sample area shall be at least 70 sq ft. Locate as directed by Architect.
  - b. Commence installation of remaining metal wall panels only after Architect's acceptance of integrated field sample.
2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.
3. Approval of integral field samples does not constitute approval of deviations from the Contract Documents contained in integral field samples unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved integral field samples may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

#### 1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and opening dimensions by field measurements before metal panel fabrication, and indicate measurements on Shop Drawings.

#### 1.9 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

#### 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Structural failures including rupturing, cracking, or puncturing.
    - b. Deterioration of metals and other materials beyond normal weathering.
  2. Warranty Period: Two years from date of Substantial Completion.

- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
  - 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
    - a. Uniform pressure as indicated on Drawings.
  - 2. Deflection Limits: Metal wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/240 of the span.
- C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 1.57 lbf/sq. ft.
- D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 2.86 lbf/sq. ft.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

### 2.2 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS (074213.A03)

- A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Reveal-Joint, Concealed-Fastener Metal Wall Panels (074213.A03 – MP2): Formed with vertical panel edges and a raised flat pan between panel edges; with narrow reveal joint between panels.

1. Manufacturers and Product: Subject to compliance with requirements, provide Berridge Manufacturing Company; "HS-8 Metal Wall Panels" or comparable products from one of the following:
  - a. Centria; Concept Series.
  - b. Fabral; Silhouette HCF Series.
  - c. Morin; Integrity Series.
  - d. Products from other manufacturers, meeting specified requirements, will be considered when submitted to and accepted by Architect prior to bidding.
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
  - a. Nominal Thickness: 0.034 inch (22 gauge).
  - b. Face Texture: Stucco embossed.
  - c. Exterior Finish: Two-coat fluoropolymer.
  - d. Color: Where not indicated on Drawings, color will be selected by Architect from manufacturer's full range of standard and custom colors.
3. Panel Coverage: 8 inches with 5-5/8 inch raised pan face dimension and a 2 inch reveal.
4. Panel Height: 7/8 inch to 1 inch.

### 2.3 CONCEALED-FASTENER, LAP-SEAM METAL SOFFIT PANEL (074213.A05)

A. General: Provide factory-formed metal soffit panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners. Include accessories required for weathertight installation.

B. Flush-Profile, Concealed-Fastener Metal Soffit Panels (074213.A05 - MP1): Formed with vertical panel edges and flat pan between panel edges.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Berridge Manufacturing Company; "Thin-Line Panel" for soffits or comparable products by one of the following:
  - a. Centria.
  - b. Fabral.
  - c. Metecno-Morin (Kingspan).
  - d. Comparable products from other manufacturers will only be considered when submitted to and accepted by Architect prior to bidding.
2. Material: Zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet, 0.028-inch (0.86-mm) nominal thickness.
  - a. Exterior Finish: 2-coat fluoropolymer as standard by panel manufacturer for colors specified.
  - b. Color: Match Berridge "Parchment".
3. Panel Texture: Smooth.
4. Panel Coverage: 3-5/8 to 4 inches (305 mm).
5. Panel Height: 3/8 to 1/2 inch.

## 2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring (074213.A06): ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
  - 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
  - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim (074213.A07): Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
  - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
  - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
  - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

## 2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
  - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
  - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  - 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
  - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  - 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
    - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

## 2.6 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Mica Fluoropolymer: AAMA 621. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
4. Metallic Fluoropolymer: AAMA 621. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
5. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
  1. Verify that prefinished metal flashing "by others" has been installed and weather-lapped to drain moisture to exterior.
  2. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
  3. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
    - a. Verify that self-adhering water-resistive barriers have been installed over sheathing or backing substrate to prevent water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal panel manufacturer.
- B. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

### 3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 1. Commence metal wall panel installation and install minimum of 200 sq. ft. in presence of factory-authorized representative.
  - 2. Shim or otherwise plumb substrates receiving metal panels.
  - 3. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
  - 4. Install screw fasteners in predrilled holes.
  - 5. Locate and space fastenings in uniform vertical and horizontal alignment.
  - 6. Install flashing and trim as metal panel work proceeds.
  - 7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  - 8. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  - 9. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
  - 1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
  - 1. Apply panels to avoid "panel creep" or application not true to line.

2. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
3. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
5. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
6. Flash and seal panels with weather closures at perimeter of all openings.
7. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps; on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weathertight.
8. At panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.
9. Soffit panels shall be fastened to supports with concealed fasteners in according to manufacturer's instructions. Provide perforated (vented) soffit panels for every fourth panel where indicated.

E. Watertight Wall Panel Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit



substrates and achieve waterproof performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

#### 3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.
- D. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
- E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- F. Prepare test and inspection reports.

#### 3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213



## **SECTION 075216 - MODIFIED BITUMINOUS MEMBRANE ROOFING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. This Section specifies requirements for the modified bituminous sheet roofing system (075216.A01) including but not limited to, the following:
1. Modified bituminous surfacing ply with factory-applied mineral surfacing.
  2. Modified bituminous field ply/plies (smooth).
  3. Modified bituminous 2-ply base flashing.
  4. Roof insulation, tapered roof insulation, and cover board.
  5. Roof cant strips and tapered edge strips.
  6. Lead flashing at roof drains and plumbing vents.
  7. Liquid flashing.
  8. All accessories and fasteners needed to complete the roofing systems indicated.
- B. Related Requirements:
1. Section 053100 "Steel Decking" for steel decking requirements and installation.
  2. Section 061000 "Rough Carpentry" for wood framing, blocking, and nailers associated with roofing.
  3. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counter flashings.
  4. Division 22 for mechanical roof drain systems.
  5. Division 23 for mechanical equipment and accessory curbs.

#### **1.2 SYSTEM DESCRIPTIONS**

- A. General System Performance Requirements:
1. Roof covering shall meet UL Class A material rating.
  2. Construction shall meet FM 1-90 windstorm uplift resistance requirements.
- B. Modified Bitumen Roofing System over Metal Decking: Roofing system shall consist of base layer of insulation, mechanically fastened to metal decking; second layer of insulation shall be set in low-rise foam adhesive; a cover board set in low rise foam adhesive; a modified bitumen smooth surfaced membrane adhered with manufacturer's cold adhesive; a surfacing ply (cap sheet) shall be either a dual-reinforced (glass fiber mat and polyester mat) or a single reinforced (glass fiber mat or polyester mat) modified bitumen ply with factory-applied mineral surfacing. Surfacing ply shall be adhered with manufacturer's cold adhesive. Provide all related accessories for a complete and watertight roofing system. All laps in system shall be hot-air welded

### 1.3 ACTION SUBMITTALS

- A. Manufacturer's technical product data, installation instructions and recommendations for each type of roofing product/component required. Include data and certified test reports substantiating that materials comply with requirements.
1. Submit Factory Mutual and Underwriter's Laboratory material and systems approvals.
  2. Submit Underwriter's Laboratory material and systems approvals.
  3. Submittals shall be reviewed and accepted by roofing membrane manufacturer's technical representative with a submittal cover letter stating all products for the roof assembly including roofing membrane, base flashing, and roof insulation are acceptable.
- B. Shop Drawings: Indicate dimensions, general construction, specific modifications, component connections, details at adjoining construction and roof top accessories, anchorage methods, hardware and installation procedures; plus the following specific requirements:
1. Indicate insulation fasteners, sheet layout and fastening pattern to comply with FM construction requirements specified. If insulation and cover board is adhered with low rise foam adhesive indicated adhesive ribbons patters to comply with FM construction requirement specified.
  2. Indicate layout and thicknesses for tapered insulation and crickets.
  3. Indicate details for perimeter, penetrations, and field fabricate curbs and tie-in flashing details as approved by roof membrane manufacturer and in accordance with FM recommendations for wind uplift classification specified.
  4. Shop drawing shall show sequence of placement of roofing system, set-up locations of equipment and traffic patterns. Installation sequence shall be arranged so traffic across finished roofing system is minimized.
  5. Shop drawings shall be reviewed and accepted by roofing membrane manufacturer's technical representative. A shop drawing cover letter shall be submitted by the roofing membrane manufacturer's technical representative stating all products for the roof assembly including roofing membrane, base flashing and roof insulation are acceptable.
    - a. Shop drawings for Section 076200 "Sheet Metal Flashing and Trim" shall be reviewed concurrently with shop drawings for Section 075216 "Modified Bituminous Membrane Roofing."
- C. Samples: Submit two sets of samples indicating manufacturer's full range of standard colors for mineral surfaced cap sheet.
- D. Wind Uplift Resistance Submittal: For roofing system indicating compliance with wind uplift performance requirements.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Certifications: Submit written copy of guaranty application.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide primary roofing products including modified bitumen field and surfacing membranes, base sheet, modified bitumen flashing and bitumen/adhesive, successfully produced by a manufacturer, which has produced that type of product for not less than 5 years. Provide secondary products recommended by primary manufacturer.
- B. Installer Qualifications: The Roofing Contractor shall perform the work of this Section; and shall be a firm with not less than seven (7) years of successful experience in installation of modified bitumen roofing systems similar to those required for this project. Roofing Contractor shall be licensed by, trained by or otherwise approved in writing by the manufacturer of primary roof materials. The Contractor must be a member of NRCA or one its affiliates.
  - 1. Roofing Contractor must have successfully completed 2 projects of comparable scale within the past two years using the specified system.
  - 2. Installer shall have an EMR (Experience Modification Ratio) rating of 0.90 or less.
  - 3. Installer Certification: Obtain written certification from manufacturer of roofing system certifying that Installer is approved by manufacturer for installation of specified roofing system. Provide copy of certification to Architect prior to award of roofing work.
  - 4. Installer must be approved by roofing system manufacturer to offer specified manufacturer's warranty.
  - 5. Installer's Field Supervision: Require Installer to maintain a full-time supervisor/foreman who is on jobsite during times that roofing work is in progress and who is experienced in installation of roofing system similar to the type and scope required for this Project.
  - 6. All roofing shall be installed by employees of the installer; contract labor is not allowed.
- C. Pre-application Roofing Conference: Approximately two weeks prior to scheduled commencement of modified bitumen roofing installation and associated work, the Contractor shall conduct a meeting at Project site with Roofing Contractor, roofing membrane manufacturer's technical representative, Installer of each component of associated work, installer of rooftop units and other work in and around roofing which must precede or follow roofing work (including mechanical work), Architect if requested, roofing system manufacturer's technical representative third party inspection agency representative, and other representatives directly concerned with performance of the work. Contractor to record discussions of conference and decisions and agreements (or

disagreements) reached, and furnish copy of record to each party attending. Review foreseeable methods and procedures related to roofing work, including but not necessarily limited to the following:

1. Tour representative areas of roof substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work performed by other trades. Identify and record items to be corrected prior to commencement of work of this Section.
  2. Review roofing systems requirements (drawings, specifications and other contract documents).
  3. Review required submittals (all required submittals shall be completed prior to pre-application roofing conference).
  4. Review required submittals, both completed and yet to be completed.
  5. Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.
  6. Review required inspection, testing, certifying and material usage accounting procedures.
  7. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not a mandatory requirement.)
  8. Review temporary protection requirements for roofing system during and after installation.
  9. Review governing regulations and requirements for insurance and certificates.
  10. Roofing work will not be allowed to commence until submittals (or other language) phase has been completed.
- D. Insurance Certification: Assist the Owner in preparation and submittal of roof installation certification as may be necessary with fire and extended coverage insurance on roofing and associated work.
- E. UL Listing: Provide modified bitumen roofing materials which have been tested for application and slopes indicated and are listed by Underwriter's Laboratories, Inc. (UL) for Class A external fire exposure.
1. Provide roof covering materials bearing Classification Marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-up Service.
  2. Provide roof insulation approved in writing by roof system manufacturer as acceptable substrate for this project.
  3. Provide roofing system that can be installed to comply with UL 790 requirements specified for resistance to external fire.
- F. FM Approvals' RoofNav Listing: Modified bitumen roofing materials, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.
1. Fire/Windstorm Classification: Class 1A-90.

2. Hail-Resistance Rating: VSH.
  3. Wind Rating: System shall be capable of withstanding straight-line 3 second wind gust of at least 120 mph.
- G. Product/Material Qualifications:
1. Components of the roofing system shall be manufactured or approved by the roofing system manufacturer to comply with guaranty and construction class requirements.
  2. Fastener corrosion resistance shall be in accordance with FM Standard 4470.

#### 1.7 FIELD QUALITY CONTROL

- A. Field Audits: A technical representative shall perform in progress site audits and review completed contractor's quality control forms, prepare and submit reports to roofing contractor and owner's representative. Site audits include first day of construction and a site audit for every two weeks of construction.
- B. Final Roof Inspection: As a part of the roofing membrane manufacturer's standard warranty, arrange for roof membrane manufacturer's technical representative.
1. Notify Architect and Owner 48 hours in advance of date and time of inspection.
- C. Roofing system will be considered defective if it does not pass tests and inspections.
1. Additional testing and inspecting, at Contractor's expense will be performed to determine if replaced or additional work complies with specified requirements.

#### 1.8 PROJECT CONDITIONS

- A. Weather Condition Limitation: Proceed with roofing work only when existing and forecasted weather conditions will permit in conjunction with manufacturer's recommendation and guaranty requirements.
- B. Project Phasing: All roof insulation, cover board, edge strips, flashing, and field ply(s) shall be installed in a timely manner to allow for all other work by other trades to be completed on the roof prior to application of the surface ply and associated final layer flashing and stripping.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle modified bitumen membrane and roofing system components in accordance with roofing system manufacturer's written instructions. Store and handle components in a manner which will ensure that there is no possibility of significant moisture pickup. Unless protected from weather or other moisture sources do not leave unused membrane on the roof overnight or when roofing work is not in progress. Store modified bitumen sheets and other materials on end on pallets or other raised surface. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.
1. Cover all materials with breathable tarpaulins. Secure tarpaulins such that weather events cannot displace them after installation.

2. Remove roofing components from job site that show indications of moisture damage and replace with undamaged materials/components.
- B. Where heavy loads are placed up on or transported over decking, or where materials are repeatedly landed, provide temporary planking or plywood to distribute imposed loads.
- C. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

#### 1.10 WARRANTY

- A. Special Project Warranty: Submit two (2) executed copies of MRCA "Roofing Contractor Materials and Workmanship Warranty", for a period of two (2) years, covering work of this Section including roof membrane, composition flashing, roof insulation, fasteners, walkway pads, and roofing accessories, all stated on face of Warranty, signed and counter signed by Installer (Roofer) and Contractor.
- B. Manufacturer's Warranty: Submit executed copy of roofing manufacturer's "Full Systems – No Dollar Limit" material and workmanship warranty. Submission shall include a written a description of specified services as noted below and shall be endorsed by the Manufacturer's Technical Director. Warranty shall be from the existing decking up, including roofing system, and flashing endorsement signed by authorized representative of roofing system manufacture, on form which was published with product literature as of date of contract documents, for the following period of time:
  1. Twenty (20) years after date of substantial completion. This warranty shall include the following:
    - a. Membrane roofing, base flashings, roof insulation, fasteners, cover boards, and other components of membrane roofing system.
    - b. Flashing system at roofing system penetrations, including but not limited to pitch pans.
  2. Two-year re-inspection of the modified bitumen system.
- C. Additional Warranty Services : The following services must be provided by the roofing membrane manufacturer's technical representative:
  1. Roofing submittals shall be reviewed and accepted by roofing membrane manufacturer.
  2. Roofing shop drawings shall be reviewed and accepted by roofing membrane manufacturer.
  3. Pre-installation Conference: Roofing membrane manufacturer's technical representative shall attend the roofing pre-installation conference and document participation.
  4. Project Start up Audit: Roofing membrane manufacturer's technical representative shall conduct and document a project start up audit, typically the first or second day of roof construction.



## PART 2 PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
  - 1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
  - 2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

### 2.2 MANUFACTURERS

- A. General: Subject to compliance with specified requirements, provide roofing system from one of the manufacturers listed below. Additional manufacturers may be considered when submitted to and accepted by Architect prior to bidding. All manufacturers must meet all specified requirements, regardless of inclusion within the list below.
  - 1. Firestone Building Products (SBS or APP)
  - 2. Johns Manville (APP)
  - 3. GAF Materials Corporation (SBS or APP)
  - 4. Derbigum Americas (APP)

### 2.3 ROOF INSULATION

- A. General: If one of the approved roof insulation systems is provided that alters the system thickness from that specified, Contractor is responsible for any additional cost to add additional courses of cut brick or changes in wood blocking, flashing gravel, guards, etc.
- B. Insulation Products: Acceptable products must be approved by the roofing system manufacturer.
  - 1. UL approved insulation meeting requirements specified for fire resistance.
  - 2. FM approved insulation meeting wind uplift resistance requirements specified.
- C. Polyisocyanurate Foam Board (075216.A03) Basis-of-Design: Derbiboard rigid board of polyisocyanurate based foam core, permanently bonded to roofing glass facer sheets. Complying with requirements of ASTM C1289-11, Type II and meeting physical property requirements of RIC/TIMA Standard Specification for Polyurethane and Polyisocyanurate Roof Insulations.

1. Bottom layer of insulation shall be 1.8 to 2 inches thick and shall provide minimum aged R-value of 10.3. 4' by 8' board size preferred.
  2. Subsequent layer of insulation shall be 3.5 inches thick and shall provide minimum aged R-value of 20.5.; 4' by 4' board size preferred.
  3. Total thickness of insulation shall not be less than 5 inches and shall provide minimum aged R-value of 30. Thickness at drains shall be 1.5 inches minimum.
- D. Tapered Insulation (075216.A04): For use on roof areas and at crickets as designated on drawings.
1. Tapered polyisocyanurate insulation, complying with ASTM C1289-11, Type II.
    - a. Provide slop as indicated at each location.
  2. Minimum thickness of tapered insulation shall not be less than 1/2 inch.
  3. All pieces shall be numbered in correspondence with approved shop drawings.
  4. Miter corners of tapered insulation, lacing-in of corners is prohibited.
  5. Provide tapered insulation boards for crickets, saddles and sumps at roof drains, minimum 4 feet by 4 feet sump, and elsewhere to promote positive roof drainage.
- E. Cover Board Insulation (075216.A08):
1. Basis of Design Product: Subject to compliance with requirements, provide one of the following:
    - a. Georgia Pacific; Dens Deck Prime Roof Board.
    - b. USG; Securock Glass Fiber Roof Board.
    - c. National Gypsum; DEXCell FA Roof Board.
    - d. Comparable products from other manufacturer
  2. Product Characteristics:
    - a. Description: Glass-mat gypsum roof board compliant with ASTM C1177.
    - b. Thickness: 1/2 inch minimum.
- F. Substrate Board (Acoustical Steel Deck) (075216.A12): ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum board or ASTM C 1278/C 1278M, fiber-reinforced gypsum board.
1. Thickness: ½ inch.
  2. Surface Finish: Unprimed.
- G. Insulation Fasteners (steel deck areas only): Basis-of-Design: Derbigum Perlock standard mechanical fasteners for roofing system which has been tested for the required pull-out strength where applicable and compatible with deck type and roofing products used. Roofing Contractor is responsible for testing that may be required to substantiate required fastening methods or procedures.
1. Fasteners shall meet requirements of FM 4470 for corrosion resistance.
  2. Fastener Plates for Insulation: Provide 3 inch diameter, galvalume coated steel plates as recommended by roofing system manufacturer.
  3. Fastener length shall be adequate to penetrate load bearing surface of steel deck 3/4 inch.

H. Low Rise Foam Adhesive : Manufacturer recommended dual-component low rise urethane adhesive (asbestos free).

1. VOC Emissions: 245 grams per liter, maximum, per ASTM D 3960-92
2. Flash Point (COC): 105 degrees F, minimum , per ASTM D 92
3. Solids Content: 77.5 percent, minimum, by weight per ASTM D 4479
4. Density: 9.5 pounds/gallon, minimum, at 77 degrees F per ASTM D 70

## 2.4 MODIFIED BITUMEN ROOFING COMPONENTS

A. General Note :

1. Total Membrane Thickness shall be defined as the combined thickness of the field ply (base sheet) and surface ply (cap sheet), excluding adhesive layers.
2. Total Membrane Thickness shall be not less than 280 mils without prior acceptance by Architect, prior to bidding, using the form and guidelines contained in Section 012500 "Substitution Procedures" and Substitution Request Form. The following basis of design thicknesses shall be provided in the absence of written documentation from the Architect.
  - a. Field Ply (Base Sheet) Basis of Design Thickness: 120 mils.
  - b. Surface Ply (Cap Sheet) Basis of Design Thickness: 160 mils, minimum.
3. Roof Areas within UL-listed assemblies shall be fabricated and installed per the listed requirements of the UL-listing indicated on the Drawings.
4. Surface Ply (Cap Sheet) shall be Class A rated per ASTM E 108 and UL 790.

B. Field Ply (Base Sheet) – Provide a smooth-surfaced reinforced modified bituminous membrane from one of the listed manufacturers that will meet the criteria for one of the following standards:

1. ASTM D6509 – APP modified bituminous membrane with fiberglass reinforcement.
2. ASTM D6163, Grade S – SBS modified bituminous membrane with fiberglass reinforcement.
3. ASTM D6164, Grade S – SBS modified bituminous membrane with polyester reinforcement.

C. Surface Ply (Cap Sheet) – Provide a fire retardant, mineral granule-surfaced, reinforced modified bituminous membrane from one of the listed manufacturers that will meet the criteria for one of the following standards:

1. ASTM D6222, Grade G – APP modified bituminous membrane with polyester reinforcement.
2. ASTM D6223, Grade G – APP modified bituminous membrane with polyester and fiberglass reinforcement.
3. ASTM D6162, Grade G – SBS modified bituminous membrane with polyester and fiberglass reinforcement.
4. ASTM D6163, Grade G – SBS modified bituminous membrane with fiberglass reinforcement.
5. ASTM D6164, Grade G – SBS modified bituminous membrane with polyester reinforcement.

D. Cold-Applied Adhesive – Provide manufacturer's recommended cold-applied adhesive for field membrane and base flashing applications to be asphalt-based, asbestos-free and VOC compliant, cold-applied adhesive

specially formulated for compatibility and use with modified bituminous membrane roofing and flashing. Cold-applied adhesive shall have the following properties:

1. VOC Emissions: 180 grams per liter, maximum per ASTM D 3960-92.
  2. Solids Content: 80 percent, minimum by weight per ASTM D4479.
  3. Asphalt Content: 50 percent, minimum per ASTM D4479.
- E. Modified Bitumen Vertical Wall Flashing (075216.A10): Provide 2-ply base flashing of same base layer and same surfacing (cap sheet) ply as specified for field of roof. Both plies shall be adhered with manufacturer's cold-applied adhesive with heat-welded seams or by heat welding.
1. Granule Material: Mineral.
  2. Granule Color: As selected by Architect from manufacturer's full range.

## 2.5 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Roof Cant Strips (075216.A05) and Preformed Edge Strips (075216.A07): Asphalt impregnated organic fiber insulation units, factory molded to form 3-1/2" x 3-1/2" x 45 degree cant strips and 1-5/8" x 18" tapered edge strips to receive roofing ply sheet courses and lift edges above main roofing surface.
1. Wood cant strips: Provide wood cant strips, 2" in nominal thickness, where indicated and as required by roofing system manufacturer.
  2. Locations of nailable wood cant strips shall be determined by roofing system manufacturer's written recommendations. For manufacturers without written recommendations, refer to NRCA's Roofing Manual for industry standard practice and minimum requirements.
- B. Asphalt Flashing Cement: Manufacturer's recommended asbestos-free cement, complying with ASTM D 4586.
- C. Asphalt Primer: Comply with ASTM D 41.
- D. Vertical Sheet Flashing EPDM (075216.A11): ASTM D 4637, Type II, uniform, flexible EPDM sheet.
1. Thickness: 75 mils min, nominal.
  2. Exposed Face Color: Black.
  3. Contractor shall use roofing system manufacturer's seam tape required by to achieve specified guaranty/warranty. EPDM membrane shall have seam tape factory-applied when required by roofing system manufacturer
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer (these fasteners are used to fasten roofing material to substrate; not to be confused with roof insulation fasteners).
- F. Lead Flashing Sheet (drains): 30" by 30" square, 4 pound per square foot.
- G. Lead Flashing Sheet (plumbing vents): 30" by 30" square, 4 pound per square foot.

- H. Liquid-Applied Flashing: Provide a catalyzed acrylic resin specialty flashing system, consisting of liquid-applied, fully reinforced, multi-component acrylic membrane installed over a prepared and/or primed substrate. Flashing system shall consist of a primer, basecoat and topcoat, combined with a non-woven polyester fleece. Use of specialty liquid flashing system shall be specifically approved in advance by the membrane manufacturer for each application.
- I. Set on Accessories: Where small roof accessories are set on modified bitumen roofing membrane, roofing cement, and sealants.
- J. Self-Adhered Vapor Barrier: Subject to compliance with requirements, provide "VapAir Seal MD" by Carlisle Syntec Systems or a comparable product submitted to and accepted by Architect with the following product characteristics:
  - 1. Peel Adhesion : 14 lbs minimum per ASTM D903.
  - 2. Tensile Strength: 250 psi minimum per ASTM D412.
  - 3. Tear Strength: 135 lb minimum per ASTM D1970.
  - 4. Puncture Resistance: 54.5 lbs minimum per ASTM D5602.
  - 5. Water Vapor Permeability: 0.03 perms per ASTM D1970 and ASTM E96.
- K. Waterproof Expansion Joint System: Subject to compliance with requirements, provide "Redline 40" by Situra or a comparable product submitted to and accepted by Architect with the following product characteristics:
  - 1. Movement Characteristics:
    - a. Horizontal Movement Capacity: 2 inches.
    - b. Vertical Movement Capacity: 3/4 inch.
    - c. Shear Movement Capacity: 3/4 inch.
  - 2. Low Temperature Flex: -70 degrees F per ASTM D 746.
  - 3. Ultimate Elongation: 500 percent per ASTM D 412.
  - 4. Tear Strength: 220 lbs/in per ASTM D 624, Die C.
  - 5. Puncture Resistance: 10 pounds per CGSB 37.56 M96
  - 6. UV Exposure Resistance: No Cracks or Crazeing after 5000 hours per ASTM G 53.

## PART 3 EXECUTION

### 3.1 INSPECTION OF SUBSTRATE

- A. Roofing Contractor shall examine substrate surfaces to receive modified bitumen roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to the Architect.
- B. Examine surfaces for adequate anchorage, foreign materials, moisture and other conditions which would adversely affect roofing application and performance.

- C. Examine substrate to ensure roof openings, curbs, pipes sleeves, ducts or vents through roof are solidly set and cant strips and reglets are in place.
- D. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
  - 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
  - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and nailers match thicknesses of insulation.
  - 3. Verify that surface plane flatness and fastening of steel roof deck complies with industry standards.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.
- F. Prepare written documentation of conditions which could be detrimental to completion or performance of specified Work before commencing such Work. Work shall not start until defects have been corrected.
- G. Photograph interior and exterior equipment and surrounding areas and after completion of construction which may be misconstrued as damage related to demolition operations. File photographs with owner's representative.
- H. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
- D. Provide temporary barricades and other forms of protection for Owner's personnel and public from injury due to demolition work.
  - 1. Protect from damage, existing finish work that is to remain in place and becomes exposed during demolition operations.
  - 2. Protect against any material or debris dropping into the building or damaging new roof membrane.

### 3.3 INSTALLATION, GENERAL

- A. Cooperate with inspection and test agencies engaged or required to perform services in connection with modified bitumen roofing system installation.

- B. Protect other work from spillage of modified bitumen roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Protect lawn areas, building walls and windows and building equipment. Replace/restore other work damaged by installation of roofing system work.
- C. Coordinate flow of work, equipment, materials and personnel to eliminate traffic across completed new roofing systems. Provide plywood walkways for the movement of personnel, equipment and materials.
- D. Cutoffs: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary tie off one ply of modified bitumen membrane set in cold adhesive; remove at beginning of next day's work.
- E. Roof surfaces shall be thoroughly dry before application of roofing.
- F. Roofing Manufacturer's Inspection: Inspection of roofing shall be made by a responsible representative of the roofing manufacturer during application and after completion.
- G. When application of roofing is begun, total roof system shall be completed before end of day and before wet by elements (with exception of cap sheet). Install water cut-off at completion of each day's work and remove upon resumption of work.
  - 1. Precautions shall be taken to protect membrane from punctures, refer to Article 2.4 of this Section.
- H. Self-Adhered Vapor Barrier Installation (Acoustical Steel Deck): At areas indicated to receive vapor barrier, install product strictly in accordance with manufacturer's written installation instructions including, but not limited to, substrate preparations, material storage and protection, and product installation.

### 3.4 INSULATION AND COVER BOARD INSTALLATION

- A. General: Comply with insulation manufacturer's instructions and recommendation for the handling, installation, and bonding or anchorage of insulation to each different type of substrate. Roof insulation and cover board shall be dry when installed and shall be protected from weather. All materials that become wet shall be removed before the end of the day.
  - 1. Steel Deck Installation: Secure first layer of insulation to metal deck areas indicated on plans using corrosive resistant mechanical fasteners specifically designed and sized for attachment of specified board type insulation to deck type shown. Run long joints of insulation in continuous straight line, perpendicular to roof slope with ends joints staggered at least 12" between rows.
    - a. Secure insulation over entire field area of roofing, including corners and perimeters, at spacing as required by FM for Windstorm Resistance Classification specified and per applicable requirements of FM Loss Prevention Data Sheet 1-28.
      - 1) Mechanically fasten first layer.
    - b. Set prefabricated tapered insulation in low-rise foam adhesive and offset joints 12" each way from preceding insulation layer and to provide positive drainage to all exterior gutters and roof drains. Provide saddles at crickets as needed to insure there is no ponded water.
      - 1) Insulation board gaps shall not exceed 1/4". Where joints exceed 1/4", add baseboard to gap.
      - 2) No more insulation shall be applied than can be covered with required membrane specification on the same day.

2. Cover boards: Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows and stagger joints a minimum of 6" from preceding insulation layer. Loosely butt cover boards together. Adhere cover boards in low rise foam adhesive over entire field area of roofing, including corners and perimeters, at spacing as required by FM for Windstorm Resistance Classification specified and per applicable requirements of FM Loss Prevention Data Sheet 1-28.
3. Roof cant strips and tapered edge strips shall be provided at junctures of modified bitumen membrane with vertical surface, unless otherwise indicated. Roof cant strips and edge strips must be set in mastic.
4. Wood cant strips shall be mechanically fastened to supporting structure with hot-dip galvanized or stainless steel fasteners.

### 3.5 ROOFING MEMBRANE INSTALLATION

- A. General: Install in strict accordance with roofing manufacturer's written specifications and recommended details to achieve Guaranty specified.
- B. Multiple-Ply, Modified Bituminous Membrane: Install 2 plies of modified bituminous membrane, consisting of one (1) field ply and one (1) surfacing ply, starting at low point of roofing system (for DDL installation, add one additional field ply). Extend field ply to 2" (nominal) above top edge of cant strip and extend surfacing ply 4" (nominal) above top edge of cant strip; terminate in accordance with requirements to manufacturer of primary roofing materials. For DDL, the second field plies shall be heat welded. Set both plies of membrane in asphalt based cold adhesive.
  1. Nail edges of roofing membrane to exterior side of wood blocking at perimeter edges of roof prior to installing metal gravel stops/fascia. Space nails at minimum of 4" on center.
  2. Shingle in direction to shed water.
  3. Accurately align sheets, without stretching, and maintain uniform side and end laps. Stagger end laps a minimum of 18 inches or as required by manufacturer, no header sheets (belly bands) allowed for surface ply. Completely bond and seal laps, leaving no voids.
    - a. Repair tears and voids in laps and lapped seams not completely sealed.
  4. Side and end laps shall be heat welded or hot-air welded.
    - a. For DDL, side laps shall be a minimum of 4" and end laps shall be a minimum of 6".
- C. Vertical Flashing (075216.A10): Install vertical base flashing in accordance with the roofing system manufacturer's written instructions and current published details. Install multiple ply flashing consisting of one ply of APP modified bitumen field ply and one ply of modified bitumen surfacing ply at cant strips, other sloping and vertical surfaces. Flashing shall extend a minimum of 8" above roof surface and 6" onto roof surface. Install modified bitumen surface ply portion of vertical flashing system after installing surface membrane.
  1. Heat weld all seams and laps.



2. Fasten top of base flashing membranes every 8 inches. Three course the top of base flashing and over the fasteners; layer of asphalt mastic, fabric, and second layer of asphalt mastic.
- D. Vertical Flashing (EPDM) (075216.A11): Fully adhere EPDM vertical wall flashing in accordance with the roofing system manufacturer's written instructions and current published details.
- E. Horizontal Flashing (metal edge): Install modified bitumen surfacing ply using specified adhesive (no heat welding permitted). Install 12 inches of stripping ply prior to fastening metal edge. Install surfacing membrane over primed metal flanges. Surfacing membrane shall serve as strip in ply for horizontal details if approved by roofing system manufacturer.

### 3.6 MISCELLANEOUS INSTALLATION REQUIREMENTS

- A. Set on Accessories: Where small roof accessories are set on modified bitumen roofing membrane, prime top surface of metal flange, set metal flange in a bed of manufacturer's recommended roofing cement and seal penetration of membrane. The metal flanges that are required to be fastened with a patten of 3" on-center (O.C.) Staggered using angular or ring shank nails. Use surfacing ply as strip in membrane.
- B. Install liquid flashing and fleece reinforcement for roof penetrations according to roofing system manufacture's written instructions.
- C. Roof Drains: Install drain sump using tapered edge strip. Set 30-by-30-inch square lead flashing in bed of roofing-manufacturer-approved asphaltic adhesive on completed roofing membrane. Prime surface of lead flashing. Cover lead flashing with roofing membrane cap-sheet stripping and extend a minimum of 4 inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring. Install stripping according to roofing system manufacturer's written instructions.
- D. Lead Flashing Sheet (plumbing vents): Set 30 by 30 inch square lead flashing in a bed of roofing manufacturer approved asphaltic adhesive on completed membrane. Prime surface of lead flashing. Cover lead flange with roofing membrane cap sheet and extend 4 inches beyond edge of lead flashing onto field of roof membrane. Bend top of lead flashing down into the penetration a minimum of two inches.
- E. Roof Pipe Supports: Beneath pipe supports, provide a sacrificial piece of field membrane (cap sheet) permanently adhered to field membrane.
- F. Walkway Strips: Install walkway cap sheet strips over roofing membrane using same application method as used for roofing membrane cap sheet.

### 3.7 PROTECTION OF ROOFING

- A. Upon completion of roofing work (including associated work), Installer shall advise Contractor of recommended procedures for surveillance and protection of roofing during remainder of construction period. At end of construction period, or at a time when remaining construction work will in no way affect or endanger roofing (at

Contractor's option), Installer shall make a final inspection of roofing and prepare a written report (to Contractor with copy to Owner) describing nature and extent of deterioration or damage found in the work.

1. Plan work so traffic over new roofing system is kept to a minimum. Where traffic must continue over new roofing system, provide protection for the finished roof.
- B. Installer shall repair or replace (as required) deteriorated or defective work found at time of final inspection. Installer shall be engaged by Contractor to repair damages to roofing which occurred subsequent to roofing installation and prior to final inspection. Repair or replace the roofing and associated work to a condition free of damage and deterioration at time of substantial completion.
- C. Existing items, structures or areas damaged during course of construction work shall be restored/repared to a condition equal or better than it was prior to commencement of work.

### 3.8 CLEANING

- A. As work progresses and prior to completion of roofing membrane installation, clean off cold-applied adhesive, asphalt and other asphalt-based mastic spills to prevent discoloration of roofing membrane as recommended by roofing system manufacturer.
- B. Clean off footprints tracked onto roofing membrane surface as recommended by roofing system manufacturer.
- C. For general cleaning prior to Substantial Completion, power wash as recommended by roofing system manufacturer.
- D. Remove all debris and extra materials from roof surface and the project site.
- E. Contractor shall be responsible for the cost of roofing system cleanup and, damage to any property and equipment as a result of a leak during roof system installation. If the cleanup is not performed or contracted for immediately, the District (Owner) will perform or contract the cleanup at the Contractor's expense.

END OF SECTION 075216

## **SECTION 076200 - SHEET METAL FLASHING AND TRIM**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Formed Products:
  - a. Formed roof drainage sheet metal fabrications.
  - b. Formed low-slope roof sheet metal fabrications.
  - c. Formed wall sheet metal fabrications.
  - d. Formed equipment support flashings.
  - e. Premanufactured pitch pockets.

**B. Related Sections:**

1. Section 042000 "Unit Masonry" for masonry through wall flashing.
2. Section 061000 "Rough Carpentry " for wood nailers, curbs, and blocking.
3. Section 072100 "Thermal Insulation"
4. Section 074213 "Formed Metal Wall Panels" for sheet metal flashing and trim integral with metal coping and prefinished sheet metal flashing.
5. Section 075216 "Modified Bituminous Membrane Roofing" for installing sheet metal flashing and trim integral with roofing.

#### **1.2 COORDINATION**

- A.** Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B.** Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints and seams to provide leakproof, secure and non-corrosive installation.

#### **1.3 PREINSTALLATION MEETINGS**

**A. Preinstallation Conference: Conduct Conference at Project Site.**

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs and condition of other construction that affects sheet metal flashing and trim.
3. Review requirements for insurance and certificates, if applicable.
4. Review sheet metal flashing observation and repair procedures – post flashing installation.
5. Meet with Owner, Architect, Installer and other Installers whose work interfaces with or affects sheet metal flashing and trim – including installers of roofing materials, roof accessories and roof-mounted equipment.
6. Review methods and procedures related to sheet metal flashing and trim.

7. Review special roof details, roof drainage, roof penetrations, equipment curbs and condition of other construction that will affect sheet metal flashing.
8. Review sequencing of sheet metal flashing installation with other related trades to coordinate installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of records to each participant.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
  1. Identification of material, thickness, weight, and finish for each item and location in Project.
  2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
  3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
  4. Details of termination points and assemblies, including fixed points.
  5. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashing as applicable.
  6. Details of special conditions and of connections to adjoining work.
  7. Detail formed flashing and trim at a scale of not less than 3 inches per 12 inches.
  8. Include details of roof-penetration flashing.
  9. Include details of expansion joints and expansion-joint covers – show direction of expansion and contraction joints from fixed points.
  10. Shop drawings for Section 076200 “Sheet Metal Flashing and Trim” shall be reviewed concurrently with shop drawings for the following sections:
    - a. Section 075216 “Modified Bituminous Membrane Roofing”
- C. Samples for Verification: For each type of exposed finish required, prepared on 6 inch square samples of actual metal to be used in the work.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified fabricator.
- B. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.
- C. Warranty: Sample of special warranty.

## 1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
  - 1. For copings and roof edge flashings that are SPRI ES-1 compliant, shop shall be SPRI ES-1 certified and listed as able to fabricate required details as tested and approved.
  - 2. Use adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and methods needed for proper performance of the work in this section.
  - 3. In acceptance or rejection of the work of this section, the Owner will make no allowance for lack of skill on the part of the workers.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual", Sixth Edition, unless more stringent requirements are specified or shown on Drawings.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
  - 1. Roof surfaces shall be protected from damage at all times.
  - 2. In the event of damage, immediately make all repairs and replacements to the approval of the Owner and at no additional cost to the Owner.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

## 1.8 SCHEDULING

- A. All new sheet metal work shall be closely coordinated with the installation of the new roofing system.
- B. Sheet metal shall be installed directly after roofing work such that roofing terminations shall not be left unprotected by metal.

## 1.9 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
  - 1. Sheet metal flashings shall be installed in accordance with ANSI/SPRI/FM 4435/ES-1 "Wind Design Standard for Edge Systems used with Low Slope Roofing Systems" as applicable for locations and configurations indicated on Drawings.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- D. Fabricate and install roof edge flashing capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
  - 1. Wind Zone 1: For velocity pressures of 21 to 30 lbf/sq. ft.: 60-lbf/sq. ft. perimeter uplift force, 90-lbf/sq. ft. corner uplift force, and 30-lbf/sq. ft. outward force.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

### 2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
  - 1. Contractor shall use gauges or thicknesses specified or as prescribed in the referenced standards for specific girths, whichever is greater.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
  - 1. Finish: 2D (dull, cold rolled).
  - 2. Surface: Smooth, flat.

- C. **Metallic-Coated Steel Sheet:** Restricted flatness steel sheet, metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.
1. **Zinc-Coated (Galvanized) Steel Sheet:** ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
  2. **Surface:** Smooth, flat.
  3. **Exposed Coil-Coated Finish:**
    - a. **Two-Coat Fluoropolymer:** AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  4. **Colors:** As selected by Architect from manufacturer's full range. Refer to Exterior Finish Legend for color matching requirements for sheet metal flashing and trim installed adjacent to metal wall panels, storefront and curtain wall.
  5. **Concealed Finish:** Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

### 2.3 UNDERLAYMENT MATERIALS

- A. **Self-Adhering, High-Temperature Sheet (076200.A01):** Minimum 30 to 40 mils ( ) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer and compatible with self-adhering air barrier transition membrane.
1. **Thermal Stability:** ASTM D 1970; stable after testing at 240 deg F.
  2. **Low-Temperature Flexibility:** ASTM D 1970; passes after testing at minus 20 deg F.
  3. **Products:** Subject to compliance with requirements, provide one of the following:
    - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
    - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
    - c. Henry Company; Blueskin PE200 HT.
- B. **Slip Sheet:** Building paper, 3-lb/100 sq. ft. minimum, rosin sized.
- C. **Flexible Membrane Closure (076200.A04):** EPDM Sheet membrane; at roof expansion joints provide non-reinforced flexible, black EPDM synthetic rubber sheet flashing of 45 to 60 mils thickness. EPDM sheet shall have a tensile strength of not less than 1200 psi, a tear resistance of at least 20 lbs per inch and an ultimate elongation of at least 250 percent. Provide with seam and splice tape, adhesives and all other accessories required for proper and watertight installation.

### 2.4 MISCELLANEOUS MATERIALS

- A. **General:** Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.

- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
  2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
  3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
  4. Fasteners for Concealed Fastening into Wood: Provide either 1.25" x 11-gauge, stainless steel, ring shank, roofing nails or 1.25" x 11-gauge, galvanized steel, ring shank, roofing nails.
- C. Termination Bars: Provide stainless steel or aluminum bars; 1/8" thick with a 1" face and 8'-0" length. Bars shall be predrilled at 8" centers starting 4" in from each end. Sealant shall be MasterSeal NP150 by BASF.
1. Provide at building expansion joint bellows and other locations as necessary for proper watertight installation.
  2. Where installations occur adjacent to or in conjunction with fluid applied air barrier systems, coordinate installations and products with manufacturer of fluid applied air barrier system written recommendations. Refer to Section 072726 for additional information.
- D. Solder:
1. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
- E. Sealant Tape (076200.A02): Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.
- F. Elastomeric Sealant (076200.A03): ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- G. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- H. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- I. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- J. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.
- K. Pre-Manufactured Pourable Sealer Pockets: Use only on non-structural penetrations that are flexible and those that are closely spaced. Provide pre-fabricated pourable sealer pocket system filled with fast-setting, solvent-free,



multi-use waterproof sealer. Pre-fabricated pourable sealer pocket components shall connect together by means of tongue-and-groove joints, and shall be manufactured from a high-strength, flexible polyurethane elastomer. Pocket components shall join together to create pockets of varying sizes.

1. Basis-of-Design Product: Subject to compliance with requirements, provide "Lockin Pocket interlocking Pitch Pocket System" as manufactured by Weather-Tite, or comparable product submitted to and accepted by Architect prior to bidding.
2. Product Characteristics:
  - a. Pourable sealer pocket components and sealer color shall be black.
  - b. Height: Not less than 4 inches above field of roof.
  - c. Warranty: Not less than 2 years.

## 2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
  1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  2. Obtain field measurements for accurate fit before shop fabrication.
  3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
  4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch ( ) offset of adjoining faces and of alignment of matching profiles.
- C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
  1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- F. Cleats (076200.A36): Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

1. Cleats for coping, gravel stop edges and fascia caps shall be fabricated from not less than 0.040 inch thick (20 gauge) galvanized steel and shall be continuous 10 foot lengths with ¼ inch gap between sections.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

H. Do not use graphite pencils to mark metal surfaces.

## 2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters (076200.A05): Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.

1. Gutter Profile and sizes: As indicated on drawings according to cited sheet metal standard.

2. Expansion Joints: Butt type with cover plate.

3. Accessories: Wire-ball downspout strainer and Valley baffles.

4. Gutters with Girth up to 15 Inches: Fabricate from the following materials:

- a. Coil-Coated Galvanized Steel: 0.022 inch thick.

5. Gutters with Girth 16 to 20 Inches: Fabricate from the following materials:

- a. Coil-Coated Galvanized Steel: 0.028 inch thick.

B. Downspouts (076200.A07): Fabricate rectangular 4 x 6 inch downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Fabricate downspouts similar to SMACNA (Sixth Edition), Figure 1-32B.

2. Fabricated Hanger Style: SMACNA figure designation 1-35I.

- a. Hangers shall be spaced evenly not greater than 10 feet on center between eave and finished grade.

3. Fabricate from the following materials:

- a. Coil-Coated Galvanized Steel: 0.034 inch thick.

## 2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop 076200.A11) and Fascia (076200.A12): Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long sections. Furnish with 6 inch wide cover plates. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 12-inch-wide, concealed backup plate.

2. Fabricate edging similar to SMACNA (Sixth Edition), Figures 2-1B and 2-5C.

3. Fabricate fascia similar to SMACNA (Sixth Edition), Figures 2-7A and 2-7B.

- a. Coil-Coated Galvanized Steel: 0.034 inch thick.

B. Counterflashing (076200.A18): Fabricate from the following materials:

1. Coil Coated Galvanized Steel: 0.034 inch thick.

2. Fabricate similar to SMACNA (Sixth Edition), Figure 4-4D, spring action and two piece (with receiver).

3. Where indicated, fabricate counterflashing with integral reglet flange similar to SMACNA (Sixth Edition), Figure 4-4B.
- C. Flashing Receivers (076200.A19): Fabricate from the following materials:
1. Stainless Steel: 0.019 inch thick.
  2. Where receivers are indicated to project through exterior wythe, horizontal leg of receiver shall be 3 to 3-1/2 inches long.
  3. Where receivers are cut-in to masonry joint or partially embedded in masonry joint, fabricate similar to SMACNA (Sixth Edition), Figure 4-4C.
  4. Where receivers are mechanically fastened to vertical surface, vertical leg of receiver shall be at least 4 inches tall, similar to SMACNA, Figure 4-5C with receiver formed similar to Figure 4-4D.
- D. Roof-Penetration Flashing (076200.A20): Fabricate from the following materials:
1. Coil-Coated Galvanized Steel: 0.034 inch thick.

## 2.8 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:
1. Coil-Coated Galvanized Steel: 0.034 inch thick.

## 2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing (076200.A33): Fabricate from the following materials:
1. Galvanized Steel: 0.034 inch thick.
- B. Pre-Finished Miscellaneous Metal Flashing and Trim (076200.A35): Fabricated from the following materials:
1. Coil-Coated Galvanized Steel: 0.034 inch thick.
  2. Exterior Material Legend designation: "SM2" where indicated.
  3. At metal wall panels, fabricate to configurations indicated, with vertical leg not less than 4 inches tall to extend up and behind rigid insulation. Fabricate ends of flashing with end dams not less than 2 inches tall, and extending out to face of wall panel.
  4. Fabricate trim to configurations indicated.
  5. Fabricate pre-finished miscellaneous metal flashing in lengths of 8 to 10 feet. Overlap adjoining pieces 4 inches and seal joint watertight.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 UNDERLAYMENT INSTALLATION

A. General: Install underlayment as indicated on Drawings.

B. Self-Adhering High Temperature Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free.

Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.

Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

C. Flexible Membrane Closure EPDM Underlayment: Install EPDM underlayment wrinkle free and continuously sealed between sheets and all laps for watertight installation at roof expansion joints to form a bellows. Install an additional sheet over the top of coping, wall caps, and expansion joint bellows securely attached to wall substrate and adhered to over top of blocking/curb and turned down 1-1/2 inches.

D. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

### 3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. All new sheet metal work for associated with roofing, shall be closely coordinated with the installation of the new roofing system. Sheet metal associated with roofing shall be installed directly after roofing work such that roofing terminations shall not be left unprotected by metal.

2. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

3. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

4. Space cleats not more than 12 inches apart. Anchor individual cleats with two fasteners and bend tabs over fasteners.. At continuous cleats, interlock bottom edge of roof edge flashing with continuous cleat. Anchor continuous cleat to substrate at 2 inches in from each end and then at not greater than 12-inch centers. Bend tabs over fasteners.
  5. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
  6. Install sealant tape where indicated.
  7. All lap joints in pre-finished miscellaneous metal flashing shall be sealed watertight.
  8. Torch cutting of sheet metal flashing and trim is not permitted.
  9. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of EDPM underlayment and cover with a slip sheet or install a course of polyethylene sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Seal joints as shown and as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
  2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel sheet.
  2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
  3. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- G. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inch in direction of water flow. Provide EPDM bellows and EPDM cap flashing beneath expansion joint cover as specified.

### 3.4 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Hanging Gutters: Join sections with joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
1. Fasten gutter spacers to front and back of gutter.
  2. Anchor and loosely lock back edge of gutter to continuous cleat.
  3. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
  4. Anchor gutter with gutter brackets spaced not more than 36 inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
  5. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.
  2. Provide elbows at base of downspout to direct water away from building.
  3. Connect downspouts to underground drainage system indicated.
- D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set on slip sheet strip cut from extra cap sheet.

### 3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.
  - 1. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at 2 inches in from each end and then at not greater than 12-inch centers.
- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.
- F. Pourable Sealer Pocket Installation: Prepare substrates and install pockets in strict accordance with pocket manufacturer's written instructions to accommodate substrates involved.

### 3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 042000 "Unit Masonry."
- C. Opening Flashings in Frame Construction: Install continuous head, sill, and similar flashings to extend ( )4 inches beyond wall openings.

### 3.7 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.
- B. Pre-Finished Miscellaneous Metal Flashing: Coordinate installation of flashing with adjoining construction and air barrier coating. Seal lap joints watertight.

### 3.8 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

### 3.9 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers' written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200



## **SECTION 078413 - PENETRATION FIRESTOPPING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Penetrations in fire-resistance-rated walls.

**B. Related Sections:**

1. Division 07 Section "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

#### **1.2 ACTION SUBMITTALS**

**A. Product Data:** For each type of product indicated.

**B. Product Schedule:** For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

#### **1.3 INFORMATIONAL SUBMITTALS**

**A. Qualification Data:** For qualified Installer.

**B. Installer Certificates:** From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

#### **1.4 QUALITY ASSURANCE**

**A. Installer Qualifications:** A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

**B. Fire-Test-Response Characteristics:** Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
  - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
  - b. Classification markings on penetration firestopping correspond to designations listed by the following:

1) UL in its "Fire Resistance Directory."

C. Preinstallation Conference: Conduct conference at Project site.

## 1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

## 1.6 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Grace Construction Products.
  - 2. Hilti, Inc.
  - 3. Johns Manville.
  - 4. Specified Technologies Inc.
  - 5. 3M Fire Protection Products.
  - 6. Tremco, Inc.; Tremco Fire Protection Systems Group.
  - 7. USG Corporation.
- B. Single Source Responsibility: All firestopping insulation, sealants, and related firestopping accessories required to prevent the passage of fire and smoke through fire rated penetrations, smoke rated penetrations and joints shall be furnished and installed by (or installed under direct supervision of) one contractor for the entire project. All products used for this work shall be furnished by one manufacturer for the entire project.

### 2.2 PENETRATION FIRESTOPPING (078413.A01)

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
  - 1. Fire-resistance-rated walls include fire walls fire-barrier walls and fire partitions.
  - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. VOC Content: Provide penetration firestopping that complies with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - 1. Architectural Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.
- E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
  - 1. Permanent forming/damming/backing materials, including the following:
    - a. Slag-wool-fiber or rock-wool-fiber insulation.
    - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    - c. Fillers for sealants.
  - 2. Substrate primers.
  - 3. Collars.

### 2.3 FILL MATERIALS

- A. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- B. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- C. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- D. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- E. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

- F. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
  - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

## 2.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

### 3.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
  - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
  - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
  - 2. Contractor's name, address, and phone number.
  - 3. Designation of applicable testing and inspecting agency.
  - 4. Date of installation.
  - 5. Manufacturer's name.
  - 6. Installer's name.

### 3.5 FIELD QUALITY CONTROL

- A. Firestopping Manufacturer's representative shall perform and inspections of penetration firestopping. Contractor shall notify Architect and manufacturer's representative no later than seven days after penetration firestopping is complete to schedule inspection.

1. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
2. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

### 3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

## **SECTION 078446 - FIRE RESISTIVE JOINT SYSTEMS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Joints in or between fire-resistance-rated constructions. (078446.A01).

**B. Related Sections:**

1. Division 07 Section "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

#### **1.2 ACTION SUBMITTALS**

**A. Product Data:** For each type of product indicated.

**B. Product Schedule:** For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

**C. Product Test Reports:** Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

#### **1.3 INFORMATIONAL SUBMITTALS**

**A. Qualification Data:** For qualified Installer.

**B. Installer Certificates:** From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

#### **1.4 QUALITY ASSURANCE**

**A. Installer Qualifications:** A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements." Firm shall be experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

**B. Fire-Test-Response Characteristics:** Fire-resistive joint systems shall comply with the following requirements:

1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
  - a. Fire-resistive joint system products bear classification marking of qualified testing agency.
  - b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:
    - 1) UL in its "Fire Resistance Directory."

#### 1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

#### 1.6 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

### PART 2 PRODUCTS

#### 2.1 FIRE-RESISTIVE JOINT SYSTEMS (078446.A01)

- A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:
  1. Joints include those installed in or between fire-resistance-rated walls floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.
  2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
  3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Grace Construction Products.
    - b. Hilti, Inc.
    - c. Johns Manville.
    - d. Specified Technologies Inc.
    - e. 3M Fire Protection Products.
    - f. Tremco, Inc.; Tremco Fire Protection Systems Group.



- g. USG Corporation.
- C. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
  - 1. Sealant shall have a VOC content of 250 g/L or less.
- D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
  - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
  - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

### 3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
  2. Apply fill materials so they contact and adhere to substrates formed by joints.
  3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
  2. Contractor's name, address, and phone number.
  3. Designation of applicable testing agency.
  4. Date of installation.
  5. Manufacturer's name.
  6. Installer's name.

### 3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Fire-Resistive Joint System manufacturer's representative will perform inspections of completed installation of work of this Section. Contractor shall notify Architect and manufacturer's representative not later than seven days after completion of fire-resistive joint system installation to schedule inspection.
- B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.
- C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

### 3.6 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

### 3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.

- B. Wall-to-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: WW-S-0000-0999.
2. Assembly Rating: 2 hours.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class II - 25 percent compression or extension.
5. L-Rating at Ambient: As selected by Contractor to suit project conditions.

- C. Floor-to-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: FW-S-0000-0999.
2. Assembly Rating: 2 hours.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class II - 25 percent compression, extension, or horizontal shear.
5. L-Rating at Ambient: As selected by Contractor to suit project conditions.

- D. Head-of-Wall, Fire-Resistive Joint Systems (for Fire-Resistive Roof Systems):

1. UL-Classified Systems: HW-S-0000-0999.
2. Assembly Rating: 2 hours.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class II - 25 percent compression or extension.
5. L-Rating at Ambient: As selected by Contractor to suit project conditions.

- E. Head-of-Wall, Fire-Resistive Joint Systems (for Non-Fire-Resistive Roof Systems):

1. UL-Classified Systems: CJ-S-0000-0999.
2. Assembly Rating: 2 hours.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class II - 25 percent compression or extension.
5. L-Rating at Ambient: As selected by Contractor to suit project conditions.

- F. Perimeter Fire-Resistive Joint Systems:

1. UL-Classified Perimeter Fire-Containment Systems: CW-S-0000-0999.

2. Integrity Rating: 2 hours.
3. Insulation Rating: 1 hour.
4. Linear Opening Width: As indicated.
5. Movement Capabilities: Class II - 25 percent compression or extension.
6. L-Rating at Ambient Temperature: As selected by Contractor to suit project conditions.

END OF SECTION 078446

## **SECTION 079200 - JOINT SEALANTS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Polyurea joint sealants.

**B. Related Sections:**

1. Section 078446 "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
2. Section 088000 "Glazing" for glazing sealants.
3. Section 092900 "Gypsum Board" for acoustical sealant and sealing acoustical joints.
4. Division 32 Section "Concrete Paving Joint Sealants" for sealing joints in pavements, walkways, and curbing.

#### **1.2 PRECONSTRUCTION TESTING**

**A. Preconstruction Field-Adhesion Testing:** Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:
  - a. Each kind of sealant and joint substrate in exterior walls.
  - b. Sealant around perimeter of exterior windows/storefront.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
  - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
    - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory.

Do not use sealants that fail to adhere to joint substrates during testing.

#### **1.3 ACTION SUBMITTALS**

**A. Product Data:** For each joint-sealant product indicated.

- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.
- D. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- C. Field-Adhesion Test Reports: For each sealant application tested.
- D. Warranties: Sample of special warranties.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Preinstallation Conference: Conduct conference at Project site.

#### 1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

#### 1.7 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

- B. **Special Manufacturer's Warranty:** Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. **Warranty Period:** Five years from date of Substantial Completion.
- C. **Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:**
  - 1. **Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.**
  - 2. **Disintegration of joint substrates from natural causes exceeding design specifications.**
  - 3. **Mechanical damage caused by individuals, tools, or other outside agents.**
  - 4. **Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.**

## PART 2 PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. **Compatibility:** Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. **VOC Content:** Sealants and sealant primers shall comply with the following:
  - 1. **Architectural sealants shall have a VOC content of 250 g/L or less.**
  - 2. **Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.**
  - 3. **Sealants and sealant primers for porous substrates shall have a VOC content of 775 g/L or less.**
- C. **Liquid-Applied Joint Sealants:** Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- D. **Stain-Test-Response Characteristics:** Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- E. **Suitability for Contact with Food:** Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- F. **Colors of Exposed Joint Sealants:** As selected by Architect from manufacturer's full range.
- G. **Keynote Designations:** Refer to schedule at end of this Section for types and applicable substrates.
  - 1. **Sealant: (079200.A01).**
  - 2. **Sealant with backer rod: (079200.A02).**

3. Acoustical sealant: (079200.A04): Refer to Section 092900.
4. Tape Sealant (079200.A05).

## 2.2 SILICONE JOINT SEALANTS

- A. Single-Component, Non-Staining, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50 minimum, for Use NT.
  1. Products:
    - a. Tremco Incorporated; Spectrem 2
    - b. Sika Products; Sikasil WS-295 FPS
    - c. Dow; Dowsil 756 SMS Building Sealant
- B. Single-Component, Non-sag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.
  1. Products:
    - a. Dow; Dowsil 790 Silicone Building Sealant.
    - b. Sika Products; Sikasil 728 NS
- C. Mildew-Resistant, Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25 minimum, for Use NT.
  1. Products:
    - a. Tremco Incorporated; Spectrem 2
    - b. Sika Products; Sikasil GP

## 2.3 URETHANE JOINT SEALANTS

- A. Multicomponent, Non-sag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25 minimum, for Use NT.
  1. Products:
    - a. BASF Building Systems; Master Seal NP 2
    - b. Tremco Incorporated; Dymeric 240FC
    - c. Sika Products; Sikaflex; 2c NS EZ Mix
- B. Multicomponent, Non-sag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25 minimum, for Use T.
  1. Products:
    - a. BASF Building Systems; Master Seal NP 2
    - b. Tremco Incorporated; Dymeric 240FC
    - c. Sika Products; Sikaflex; 2c NS EZ Mix
- C. Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade P, Class 25 minimum, for Use T.
  1. Products:
    - a. BASF Building Systems; Master Seal SL 2
    - b. Sika Products; Sikaflex; 2c SL

## 2.4 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.



1. Products: Subject to compliance with requirements, provide one of the following:

- a. BASF Building Systems; Sonolac.
- b. May National Associates, Inc.; Bondaflex Sil-A 700.
- c. Pecora Corporation; AC-20+.
- d. Tremco Incorporated; Tremflex 834.

## 2.5 POLYUREA SEALANTS

A. Polyurea Sealant: Semi-rigid, self-leveling, 2-part type. Shore D hardness of 85 when tested in accordance with ASTM D 2240. Tensile strength of 1160 pounds per square inch when tested in accordance with ASTM D 412.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Curecrete Distribution Company, Inc.; Ashford Crete-Fill.
- b. L&M Construction Chemical, Inc. Joint Tite 750.
- c. Adhesives Technologies Corp.; Crackbond JF311.

## 2.6 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings (079200.A04): ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape (079200.A05): Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## 2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. **Surface Cleaning of Joints:** Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
  3. Remove laitance and form-release agents from concrete.
  4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
- B. **Joint Priming:** Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. **Masking Tape:** Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. **General:** Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. **Sealant Installation Standard:** Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. **Install sealant backings** of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
  2. Do not stretch, twist, puncture, or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
  4. As sealant work progresses, install tube weeps at 24 inches on center along base of metal wall panels and where indicated.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
  2. Completely fill recesses in each joint configuration.
  3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
  2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
  4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.

### 3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

### 3.6 JOINT-SEALANT SCHEDULE (079200.A01)

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
1. Joint Locations:
    - a. Isolation and contraction joints in cast-in-place concrete slabs.

- b. Joints between different materials listed above.
  - 2. Urethane Joint Sealant: Multicomponent, pourable/non-sag, traffic grade, Class 25.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. Construction joints in cast-in-place concrete.
    - b. Control and expansion joints in unit masonry.
    - c. Joints above finished grade between plant-precast concrete units, unless otherwise indicated.
      - 1) Joints below grade shall be urethane.
    - d. Joints in formed metal wall panels.
    - e. Joints within and at perimeter of storefront and curtain wall assemblies.
    - f. Control and expansion joints.
    - g. Joints between different materials listed above.
    - h. Perimeter joints between materials listed above and frames of doors, windows and louvers.
    - i. Control and expansion joints in ceilings and other overhead surfaces.
  - 2. Silicone Joint Sealant: Single component, non-staining, non-sag, neutral curing, Class 50.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
  - 1. Joint Locations:
    - a. Isolation joints in cast-in-place concrete slabs.
    - b. Other joints as indicated, except for expansion and control joints.
  - 2. Urethane Joint Sealant: Multicomponent, non-sag, traffic grade, Class 25.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior control/contraction joints in horizontal traffic surfaces.
  - 1. Joint Locations:
    - a. Control/contraction joints in concrete slabs indicated to receive sealed finish, polished concrete finish, resinous flooring and joints in slabs on grade extending to building exterior, seal watertight.
  - 2. Polyurea Joint Sealant: Polyurea, multi component, self-leveling, traffic grade.
  - 3. Joint Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints of exterior openings where indicated.
    - c. Vertical joints on exposed surfaces of interior unit masonry and concrete.
  - 2. Joint Sealant: Urethane, multicomponent, non-sag, Class 25, paintable.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Joint Sealant Application: Interior joints in vertical surfaces.
  - 1. Joint Locations:
    - a. Vertical joints in exposed surfaces of gypsum drywall partitions.
    - b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
  - 2. Joint Sealant: Acrylic based, paintable.
  - 3. Joint Sealant Color: As selected by Architect from manufacturer's full range of colors.

G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:

- a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
- b. Tile control and expansion joints where indicated.

2. Joint Sealant: Single component, non-sag, mildew resistant, acid curing, Silicone.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200



## **SECTION 079500 - EXPANSION CONTROL**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Exterior wall expansion control systems.
  - 2. Interior expansion control systems.
- B. Related Requirements:
  - 1. Section 044319 "Adhered Thin Masonry Veneer" for expansion joints installed with thin brick assembly.
  - 2. Section 078446 "Fire-Resistive Joint Systems" for liquid-applied joint sealants in fire-resistive building joints.
  - 3. Section 079200 "Joint Sealants" for liquid-applied joint sealants and for elastomeric sealants without metal frames.

#### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for expansion joint cover assemblies.
- B. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- C. Samples: For each type of expansion control system indicated to verify matching existing expansion joints.
  - 1. Include actual samples not less than 6 inches in length by actual width.
- D. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
  - 1. Manufacturer and model number for each expansion control system.
  - 2. Expansion control system location cross-referenced to Drawings.
  - 3. Nominal joint width.
  - 4. Movement capability.
  - 5. Materials, colors, and finishes.
  - 6. Product options.
  - 7. Fire-resistance ratings.
- E. Samples for Initial Selection: For each type of exposed finish.

1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric-seal material.

F. Samples for Verification: For each type of expansion joint cover assembly, full width by 6 inches long in size.

## PART 2 PRODUCTS

### 2.1 SYSTEM DESCRIPTION

A. General: Provide expansion control systems of design, basic profile, materials, and finish that match existing.

1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.

B. Coordination: Coordinate installation of exterior wall expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.

### 2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.

### 2.3 EXTERIOR WALL EXPANSION CONTROL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide specified product or products by one of the following:

1. Balco, Inc.
2. Watson Bowman Acme Corp.; a BASF Construction Chemicals business.
3. Comparable products from other manufacturers submitted to and accepted by Architect prior to bidding.

B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

C. Wall-to-Wall: Exterior Preformed Cellular Foam (079500.A20):

1. Basis-of-Design Product: EMSEAL Corporation; "Colorseal".
2. Design Criteria:
  - a. Nominal Joint Width: 1-1/2 or 2 inches, unless otherwise indicated.
  - b. Movement Capability: -25 percent/+25 percent.
  - c. Type of Movement: Thermal.
3. Type: Preformed cellular foam with factory pre-coated face.
  - a. Foam Material: Manufacturer's standard.
4. Face Seal Material: Manufacturer's standard, factory pre-coated.
  - a. Color: As selected by Architect from manufacturer's full range.



## 2.4 INTERIOR EXPANSION CONTROL SYSTEMS

- A. Source Limitations: Obtain expansion control systems from single source from single manufacturer.
- B. Expansion Cover Plate (079500.A01): Provide aluminum, floor-to-floor expansion cover plate. Plate shall be 1/8 inch thick and in a width to match existing adjacent expansion joint covers. Finish shall also match existing adjacent expansion joint covers.
  - 1. Basis-of Design Product: Subject to compliance with requirements, provide one of the following:
    - a. National Guard Products; Model #818.
    - b. Pemko; Model 18/1A.
    - c. Reese; Model BAP18.
- C. Preformed Cellular Foam (079500.A06):
  - 1. Basis-of-Design Product: EMSEAL Corporation; "Colorseal".
  - 2. Design Criteria:
    - a. Nominal Joint Width: 2 inches, unless otherwise indicated.
    - b. Movement Capability: -25 percent/+25 percent.
    - c. Type of Movement: Thermal.
  - 3. Type: Preformed cellular foam with factory pre-coated face.
    - a. Foam Material: Manufacturer's standard.
  - 4. Face Seal Material: Manufacturer's standard, factory pre-coated.
    - a. Color: As selected by Architect from manufacturer's full range.
- D. Pre-Formed Cellular Foam Secondary Seals (079500.A23):
  - 1. Basis-of-Design Product: EMSEAL Corporation; "Backerseal".
  - 2. Design Criteria:
    - a. Nominal Joint Width: 2 inches, unless otherwise indicated.
    - b. Movement Capability: -25 percent/+25 percent.
    - c. Type of Movement: Thermal.
  - 3. Type: Preformed cellular foam.
    - a. Foam Material: Manufacturer's standard.

## 2.5 MATERIALS

- A. Aluminum: ASTM B221, Alloy 6063-T5 for extrusions; ASTM B209, Alloy 6061-T6 for sheet and plate.
  - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Accessories: Manufacturer's standard and recommended fasteners, adhesives, and other accessories compatible with material in contact, as indicated or required for complete installations.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 SURFACE PREPARATION

- A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

### 3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
  - 1. Install frames in continuous contact with adjacent surfaces.
    - a. Shimming is not permitted.
  - 2. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
  - 3. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
  - 4. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
  - 5. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
- C. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
  - 1. Provide in continuous lengths for straight sections.
  - 2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
  - 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.
- E. Foam Seals: Install with adhesive recommended by manufacturer.
- F. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.

### 3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

- B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 079500



## SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section includes hollow-metal work.
  - 1. Interior hollow-metal doors (081113.A01).
  - 2. Exterior insulated hollow-metal doors (081113.A11).
  - 3. Hollow-metal frames (081113.A31).
- B. Related Requirements:
  - 1. **Section 012300 "Alternates" for alternates effecting work of this Section.**
  - 2. Section 042000 "Unit Masonry" for embedding anchors for hollow-metal work into masonry.
  - 3. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.
  - 4. Section 099123 "Interior Painting" for field painting of hollow-metal work.
  - 5. Section 099600 "High Performance Painting" for field painting of hollow-metal work.
  - 6. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

#### 1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

#### 1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.
- B. Shop Drawings: Include the following:
  - 1. Furnish a schedule of doors and frames using same reference numbers for details and openings as those on Drawings.
  - 2. Elevations of each door type.
  - 3. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.

4. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
5. Locations of reinforcement and preparations for hardware.
6. Details of each different wall opening condition.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.
10. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than 6 by 8 inches.

D. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.
- B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
  1. Provide additional protection to prevent damage to factory-finished units.
  2. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- B. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

## 1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Ceco Door Products; an Assa Abloy Group company.
  2. Curries Company; an Assa Abloy Group company.

3. Republic Doors and Frames.
4. Steelcraft; an Ingersoll-Rand company.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

## 2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
2. For areas required to receive a fire rating of 45 minutes or greater, fire testing shall be based on fire resistive criteria according to NFPA 251 or ASTM E119.

B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

1. For areas required to receive a fire rating of 45 minutes or greater, fire testing shall be based on fire resistive criteria according to NFPA 251 or ASTM E119.

## 2.3 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2.

1. Physical Performance: Level B according to SDI A250.4.
2. Doors (081113.A01):
  - a. Type: As indicated in the Door and Frame Schedule.
  - b. Thickness: 1-3/4 inches.
  - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (18 gauge).
    - 1) Provide metallic-coated cold rolled steel in areas exposed to moisture and as indicated on Drawings.
  - d. Edge Construction: Model 1, Full Flush.
  - e. Core: Manufacturer's standard kraft-paper honeycomb or mineral-board.
3. Frames (081113.A31):
  - a. Materials: Uncoated steel sheet, minimum thickness of 0.067 inch (14 gauge).
    - 1) Provide metallic-coated cold rolled steel in areas exposed to moisture and as indicated on Drawings.
  - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
  - c. Construction: Face welded.
  - d. Reinforcement: Provide high frequency hinge reinforcement at top hinge location.
4. Exposed Finish: Prime.

## 2.4 EXTERIOR DOORS AND FRAMES

### A. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 4.

1. Physical Performance: Level A according to SDI A250.4.
2. Doors (081113.A11):
  - a. Type: As indicated in the Door and Frame Schedule.
  - b. Thickness: 1-3/4 inches.
  - c. Face: Metallic coated, cold-rolled steel sheet, minimum thickness of 0.053 inch (16 gauge) , with minimum A40 coating.
  - d. Edge Construction: Model 2, seamless.
  - e. Top of Door: Provide top of door with flush top cap.
  - f. Core: Polyurethane or Polyisocyanurate with vertical steel stiffeners.
    - 1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 10 when tested according to ASTM C 1363.
3. Frames (081113.A31): Provide at all Level 3 and Level 4 hollow-metal doors and wood doors.
  - a. Materials: Metallic coated steel sheet, minimum thickness of 0.067 inch (14 gauge), with minimum A40 coating.
    - 1) Provide uncoated steel sheet for interior frames, same thickness as exterior frames.
  - b. Construction: Face welded.
  - c. Reinforcement: Provide high frequency hinge reinforcement at top hinge location.
4. Exposed Finish: Prime.

## 2.5 BORROWED LITES

- A. Hollow-metal frames of uncoated steel sheet, minimum thickness of 0.053 inch (16 gauge).
- B. Construction: Face welded.

## 2.6 FRAME ANCHORS

- A. General: Anchors for High Wind Area door, frame assemblies shall meet FEMA/ICC 500-2014 requirements. Provide anchoring approved by UL or Intertek Testing Services / Warnock Hershey (ITS/WHI), supported by testing and third party professional engineering reports. Follow installation instructions to meet specified regulatory requirements.
- B. Jamb Anchors:
  1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
  2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
  3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
  4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- C. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
  1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.



2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

## 2.7 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
  1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Section 088000 "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.8 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
  1. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
  2. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
  3. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.

4. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
  5. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
  6. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
  2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
  4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
  5. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
      - 1) Two anchors per jamb up to 60 inches high.
      - 2) Three anchors per jamb from 60 to 90 inches high.
      - 3) Four anchors per jamb from 90 to 120 inches high.
      - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
    - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Three anchors per jamb up to 60 inches high.
      - 2) Four anchors per jamb from 60 to 90 inches high.
      - 3) Five anchors per jamb from 90 to 96 inches high.
      - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
    - c. Compression Type: Not less than two anchors in each frame.
    - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
  6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
  2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
  3. Provide high frequency hinge reinforcement on top hinge only (two additional 10 gauge reinforcements are welded at 3 places each) on all door frames.
- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
  2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
  4. Provide loose stops and moldings on inside of hollow-metal work.
  5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

## 2.9 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## 2.10 ACCESSORIES

- A. Louvers: Provide louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
  2. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same qualified testing and inspecting agency that established fire-resistance rating of door assembly.
- B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
- C. Provide high frequency hinge reinforcement on top hinge only (two additional 10 gauge reinforcements are welded at 3 places each) on all door frames.
- D. Reinforce doors and frames to receive continuous hinges where scheduled.

### 3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install frames with removable stops located on secure side of opening.
    - d. Install door silencers in frames before grouting.
      - 1) Provide mortar guards for hinge and strike plate cutouts and any electrical components attached to frames.
    - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
  - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
  - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
  - 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.

6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Metal Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
  - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
  1. Non-Fire-Rated Steel Doors:
    - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
    - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
    - c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
    - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
  2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
  3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
  1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113



## SECTION 081416 - FLUSH WOOD DOORS

### PART 1 GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces (081416.A01).
2. Solid-core doors with plastic-laminate faces (081416.A02).
3. Factory finishing flush wood doors.
4. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. **Section 012300 "Alternates" for those alternates affecting work of this Section.**
2. Section 081113 "Hollow Metal Doors and Frames" for hollow metal frames.
3. Section 087100 "Door Hardware" for hardware in flush wood doors.
4. Section 088000 "Glazing" for glass view panels in flush wood doors.

#### 1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
1. Dimensions and locations of blocking.
  2. Dimensions and locations of mortises and holes for hardware.
  3. Dimensions and locations of cutouts.
  4. Undercuts.
  5. Requirements for veneer matching.
  6. Doors to be factory finished and finish requirements.
  7. Fire-protection ratings for fire-rated doors.
- C. Samples for Initial Selection: For
1. Factory finished doors.
  2. Plastic-laminate door faces.
- D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
  - a. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
2. Plastic laminate, 6 inches square, for each color, texture, and pattern selected.
3. Louver blade and frame sections, 6 inches long, for each material and finish specified.
4. Frames for light openings, 6 inches long, for each material, type, and finish required.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Certificates: For door manufacturer as set forth in Quality Assurance article.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is a certified participant in AWI's Quality Certification Program.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

#### 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

#### 1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
    - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
  2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
  3. Warranty Period for Solid-Core Interior Doors: Life of installation.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements provide products by one of the following:
  1. Algoma / Marshfield / Mohawk / Masonite Architectural Doors



2. Eggers Industries.
3. Graham Wood Doors; an Assa Abloy Group company.
4. Oshkosh Door Company.
5. VT Industries, Inc.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

## 2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

1. Provide labels indicating that doors comply with requirements of grades specified.
2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. WDMA I.S.1-A Performance Grade:

1. Extra Heavy Duty.

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
4. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
5. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

D. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

E. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2.
2. Blocking: Provide wood blocking in particleboard-core doors as follows:

- a. 5-inch top-rail blocking, in doors indicated to have closers.
  - b. 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
3. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

F. Structural-Composite-Lumber-Core Doors:

- 1. Structural Composite Lumber: WDMA I.S.10.
  - a. Screw Withdrawal, Face: 700 lbf.
  - b. Screw Withdrawal, Edge: 400 lbf.

G. Mineral-Core Doors:

- 1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
- 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:
  - a. 5-inch top-rail blocking.
  - b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
  - c. 5-inch midrail blocking, in doors indicated to have armor plates.
  - d. 5-inch midrail blocking, in doors indicated to have exit devices.
- 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
  - a. Screw-Holding Capability: 550 lbf per WDMA T.M.-10.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors (081416.A01):

- 1. Grade: Premium, with Grade A faces.
- 2. Species:
  - a. Red Oak or White Oak as selected by Architect to match existing wood doors.
- 3. Cut:
  - a. Plain sliced (flat sliced).
  - b. Match cut of existing doors at project site.
- 4. Match between Veneer Leaves:
  - a. Book match.
  - b. Match veneer matching of existing doors at project site.
- 5. Assembly of Veneer Leaves on Door Faces: Running match.
- 6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
- 7. Exposed Vertical and Top Edges: Same species as faces - edge Type A.
  - a. Stile edges shall be 2-ply, not less than 1-3/8 inch thick. Outer hardwood edge ply shall be 5/8 inch thick. Inner ply shall be structural composite lumber or hardwood. Stile edges shall be continuous and shall not be finger jointed.
- 8. Core: Particleboard or structural composite lumber.
- 9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
  - a. MDF cross bands are not acceptable.

10. Color:

- a. Stains shall be custom-mixed to match Architect's sample and selections.
- b. Match color of existing wood doors at each location as determined by Architect and Owner from manufacturer's full range of options.

2.4 PLASTIC-LAMINATE-FACED DOORS

A. Interior Solid-Core Doors (081416.A02):

1. Grade: Premium.
2. Plastic-Laminate Faces: High-pressure decorative laminates complying with NEMA LD 3, Grade HGS.
3. Colors, Patterns, and Finishes: As selected by Architect to match existing wood doors.
4. Exposed Vertical and Top Edges: Plastic laminate that matches faces, applied before faces.
5. Core: Particleboard or Structural composite lumber.
6. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before faces and crossbands are applied. Faces are bonded to core using a hot press.

2.5 LIGHT FRAMES AND LOUVERS

A. General: Light frames are to match light frames in existing doors for each school. Contractor shall field verify material type and profile for light frames.

B. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish.

1. Colors to be selected by Architect from full range of manufacturer's options.
2. Fire Rated Doors: Products shall be listed and labeled for use in doors with fire protection rating required on doors schedule on Drawings.

C. Metal Louvers:

1. Blade Type: Vision-proof, inverted Y.
2. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, with baked-enamel- or powder-coated finish.

D. Louvers for Fire-Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire-protection rating of 1-1/2 hours and less.

1. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, with baked-enamel- or powder-coated finish.
2. Fire Rated Doors: Products shall be listed and labeled for use in doors with fire protection rating required on doors schedule on Drawings.

2.6 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
  - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
  - 1. Fabricate door and transom panels with full-width, solid-lumber meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Factory cut and trim openings through doors.
  - 1. Light Openings: Trim openings with moldings of material and profile indicated.
  - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
  - 3. Louvers: Factory install louvers in prepared openings.

## 2.7 SHOP PRIMING

- A. Doors for Transparent Finish: Shop prime faces and all four edges with stain (if required), other required pretreatments, and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing." Seal edges of cutouts and mortises with first coat of finish.

## 2.8 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
  - 1. Finish two faces, two vertical edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
    - a. Where top edge is visible from an upper level (occupiable space) top edge shall be finished.
- B. Factory finish doors that are indicated to receive transparent finish.
- C. Transparent Finish:
  - 1. General: Intent is to match Architect's control sample.
  - 2. Grade: Premium.
  - 3. Finish: Provide one of the following finishes:
    - a. AWI's "Architectural Woodwork Standards" System 10, UV curable, water based polyurethane.
    - b. WDMA TR-6 catalyzed polyurethane.
  - 4. Staining: Custom, to match Architect's control sample.
  - 5. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
  - 6. Sheen: Satin.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
  - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
  - 1. Install fire-rated doors according to NFPA 80.
  - 2. Install smoke- and draft-control doors according to NFPA 105.
  - 3. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
    - a. Comply with NFPA 80 for fire-rated doors.
    - b. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

### 3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416



## **SECTION 084113 - ALUMINUM FRAMED ENTRANCES AND STOREFRONTS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

##### **A. Section Includes:**

1. Exterior thermally broken storefront framing (084113.A01).
  - a. Window walls.
  - b. Punched openings.
2. Interior non-thermally broken storefront framing (084113.A02).
  - a. Window walls.
3. Exterior heavy-duty manual-swing aluminum doors (084113.A12 - E10).
4. Interior standard-duty manual-swing doors (084113.A11 - E9).
5. Framing Accessories
  - a. Aluminum Subsills (084113.A07)
  - b. Aluminum Closure Flashing (084113.A08)
  - c. Aluminum Pan Flashing (084113.A09)
  - d. Jamb Closure Membrane (084113.A11)

##### **B. Related Requirements:**

1. Section 079200 "Joint Sealants" for installation of joint sealants installed in storefronts and entrance framing and for sealants not specified in this Section.
2. Section 087100 "Door Hardware" for door hardware for aluminum doors.
3. Section 088000 "Glazing" for glass within storefront and entrance systems.

#### **1.2 PREINSTALLATION MEETINGS**

- ##### **A. Preinstallation Conference:** Conduct conference at Project site.

#### **1.3 ACTION SUBMITTALS**

##### **A. Product Data:** For each type of product.

1. Include construction details, installation instructions, material descriptions, dimensions of individual components and profiles, hardware, accessories and finishes.

##### **B. Shop Drawings:** For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Elevations shall be drawn at ½ inch scale.
2. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
3. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
  - a. Joinery, including concealed welds.
  - b. Anchorage.
  - c. Interface with adjoining building construction.

- d. Expansion provisions.
  - e. Glazing.
  - f. Flashing and drainage.
- 4. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
  - 1. Architect reserves the right to require additional samples for verification purposes that show fabrication techniques and workmanship.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
  - 1. Joinery, including concealed welds.
  - 2. Anchorage.
  - 3. Expansion provisions.
  - 4. Glazing.
  - 5. Flashing and drainage.
- F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and field-testing agency.
- B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
  - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Preconstruction Test Reports: For sealant.
- E. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- F. Source quality-control reports.
- G. Field quality-control reports.
- H. Sample Warranties: For special warranties.



## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances, storefronts and sunshade to include in maintenance manuals.

## 1.6 QUALITY ASSURANCE

- A. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
  - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.
- E. Source Limitations:
  - 1. For Aluminum-Framed Storefront Systems: Obtain from single source from single manufacturer.
  - 2. For Heavy-Duty Door Systems: Obtain from single source from single manufacturer.

## 1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver aluminum framing components in manufacturer's original protective packaging.
- B. Store aluminum components in a clean dry location away from uncured masonry and concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in a manner to permit circulation of air.
  - 1. Stack framing components in a manner that will prevent bending and avoid damage.

## 1.8 PROJECT CONDITIONS

- A. Field Measurements: Check openings by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay in the work.
- B. Commencement of aluminum entrance and storefront work will be construed as Installer's acceptance of substrate surfaces and rough openings indicated to receive work of this Section.

## 1.9 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration created by wind and thermal and structural movements.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - d. Water penetration through fixed glazing and framing areas.
    - e. Failure of operating components.
  2. Warranty Period: Two years from date of Substantial Completion.
  3. Warranty period for heavy-duty doors and associated frames shall be ten (10) years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  2. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.
- C. Structural Loads:
1. Wind Loads: As indicated on Drawings.

2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
  2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
    - a. Refer to Structural Drawings for additional information regard structure and deflection criteria.
  3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
    - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.
- E. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
  2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
  3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
    - a. Maximum air leakage of 0.04 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
  2. Entrance Doors:
    - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
    - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10.0 lbf/sq. ft. for entrance/storefront framing.
  2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- H. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
  2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.
- I. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.40 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
  2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
  3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.
- J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
  2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
    - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
    - b. Low Exterior Ambient-Air Temperature: 0 deg F.
    - c. Interior Ambient-Air Temperature: 75 deg F.

## 2.2 MANUFACTURERS AND PRODUCTS

- A. Basis-of-Design Criteria: Drawings indicate sizes, profiles, and dimensional requirements for storefront, entrance and window framing systems required, that are based on specific types, models and performance criteria indicated. Systems from other manufacturers may be considered, provided deviations in dimensions, profiles and performance are minor and do not change the design concept as judged by the Architect. Burden of proof is on the proposer.
- B. Basis-of-Design Products for Storefront Framing System: Subject to compliance with requirements, provide or one of the systems listed below or comparable product submitted to and accepted by Architect prior to bidding.
1. Thermally Broken Storefront and Entrance Framing (084113.A01 – Center Plane Glazed):
    - a. Basis of Design: Kawneer North America; Trifab VG 451T.
    - b. EFCO Corporation; S 403.
    - c. Manko Windows and Doors; 2450 Series.
    - d. Tubelite; 14000.
  2. Non-thermal Storefront and Entrance Framing (084113.A02 – Center Plane Glazed):
    - a. Basis-of-Design: Kawneer North America; Trifab VG 451.
    - b. EFCO Corporation; Series 402 NT.
    - c. Manko Windows and Doors; 450 Series.
    - d. Tubelite; 14000 Series (non-thermal).
  3. Heavy-Duty (Stile and Rail Construction) Manual-Swing Doors and Associated Frames:
    - a. Basis-of-Design: Special-Lite, Inc.

- 1) Exterior heavy-duty manual-swing entrance doors (084113.A12): Model "SL-15" (wide stile).
4. Interior standard-duty manual-swing doors (084113.A11):
  - a. Basis-of-Design: Kawneer North America; Series 500 Wide Stile.
  - b. EFCO Corporation; D-500.
  - c. Manko Windows and Doors; 150 Series.
  - d. Tubelite; Comparable product.
- C. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

### 2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
  1. Construction:
    - a. Thermally broken
    - b. Non-Thermal
  2. Glazing System:
    - a. Retained mechanically with gaskets on four sides.
  3. Glazing Plane:
    - a. Exterior:
      - 1) Center plane glazed.
    - b. Interior:
      - 1) Center plane glazed.
  4. Finish: Refer to Exterior Finish Legend on Drawings for locations.
    - a. Class 1, clear anodized finish.
  5. Fabrication Method: Field-fabricated stick system.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Pressure Caps: Manufacturer's standard snap-on aluminum caps that mechanically retain glazing.
  1. Provide extended caps where indicated.
  2. At 90 degree outside corners, provide pre-manufactured mullion cap/trim as single unit to cover both sides where shown.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- E. Materials:
  1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
    - a. Sheet and Plate: ASTM B 209.
    - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
    - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
    - d. Structural Profiles: ASTM B 308/B 308M.
  2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface

preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

- a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
- b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
- c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

## 2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. General:

- a. Thermal Construction: Manufacturer's standard elastomeric type.
- b. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
  - 1) Provide nonremovable glazing stops on outside of door.

2. Heavy Duty - Stile and Rail Door Construction (084113.A12): 1-3/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Corners shall be mortised and tenon construction, reinforced with 3/8-inch diameter galvanized steel concealed tie rods. Glass stops shall be integral with stile and rail extrusions on one side.

- a. Exterior heavy-duty manual-swing entrance doors (084113.A04): Doors shall have 4-3/4-inch-wide stiles, 6-1/2-inch top rail, 12-inch intermediate rail and 10 inch bottom rail.

3. Standard Duty – Manual Swing Doors (084113.A11): 1-3/4 inch overall thickness, with minimum 0.125-inch-thick thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods .

- a. Doors shall have 4-1/2- to 5-inch wide stiles, 6-1/2 inch top rail, 8 inch intermediate rail and 10 inch bottom rail.

B. Entrance Door Framing and Subframing:

1. Door Framing (Heavy Duty Doors):

- a. For 4-1/2 inch framing – Basis of Design: Special-Lite, Inc.; "SL-245FG", compatible with storefront framing system.
- b. At the request of the Owner, substitutions for this product are not allowed.

2. Door Subframing: Manufacturer's standard, not greater than 1-inch face dimension for use at entrances within curtain wall. Finish to match adjacent curtain wall framing.

## 2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

1. Hardware for heavy-duty aluminum doors shall be installed at the door manufacturer's factory and be included in the warranty.

B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule, Section 087100 "Door Hardware", and as specified hereinafter.

1. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

2. Opening Force Requirements:

- a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.

- b. Accessible Interior Doors: Not more than 5 lbf to fully open door.
- C. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:
  - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in "Entrance Door Hardware Sets" Article.
  - 2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.
- D. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- E. Weather Stripping: Manufacturer's standard replaceable components. "Fin" type stops and vinyl weatherstripping are not acceptable.
  - 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
  - 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- F. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- G. Silencers: BHMA A156.16, Grade 1.
- H. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.
- I. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

## 2.6 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.
  - 1. Sealant shall have a VOC content of 250 g/L or less.
  - 2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with other system components with which it comes in contact;

recommended by weatherseal-sealant and glazed storefront manufacturers for this use.

1. Color: As selected by Architect from manufacturer's full range of colors.
2. Color: Match structural sealant.

E. Security Glazing: Provide a minimum edge engagement of 5/8" to augment performance.

## 2.7 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Exposed Fasteners: Do not use exposed fasteners except for application of hardware. For application of exposed hardware, use exposed fasteners with countersunk Phillips screw heads or flat-head machine screws, fabricated from 300 series stainless steel.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

C. Aluminum Subsills (084113.A07): Provide high performance subsill that incorporates a watertight interior back leg with end dams and integral water collection trough that weeps to exterior. Subsill shall be of profile and dimensions required for installation indicated. Finish subsill to match adjacent aluminum framing. Seal all penetrations through subsills to be watertight.

1. Provide high performance subsills at all storefront, entrance and window framing, unless specifically indicated otherwise.

D. Aluminum Closure Flashing (084113. A08): Provide prefinished aluminum, not less than 0.090 inch thick, of alloy and type selected by manufacturer for compatibility with other components. Fabricate closure flashing to configurations indicated. Finish to match adjacent storefront, entrance and window framing. Seal closure flashing to be watertight.

E. Aluminum Pan Flashing (084113.A09): Provide prefinished aluminum, not less than 0.090 inch thick, of alloy and type selected by manufacturer for compatibility with other components. Fabricate pan flashing to configurations indicated to direct water to exterior away from storefront and window framing. Finish to match adjacent storefront and window framing.



- F. Aluminum Jamb Extensions (084113.A14): prefinished aluminum of finish, size, profile and material to match framing system. Anchor to framing member. Extension depth as indicated on drawings.
- G. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- H. Jamb Closure Membrane (084113.A11):
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following products:
    - a. "CCW-705-TWF"; as manufactured by Carlisle Coatings and Waterproofing.
    - b. "Perm-A-Barrier Wall Flashing"; as manufactured by Grace Construction Products.
    - c. "Air-Shield"; as manufactured by W. R. Meadows, Inc.
    - d. "Blueskin"; as manufactured by Henry Corp.
  - 2. Product Characteristics:
    - a. Self-adhering, membrane, 40 mils thick.
    - b. Flashing shall function as an air, vapor and water barrier.
    - c. Flashing shall be compatible with air barrier coating specified in Section 072729.
- I. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

## 2.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Physical and thermal isolation of glazing from framing members.
  - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 5. Provisions for field replacement of glazing from interior.
  - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Storefront Framing: Fabricate components for assembly using shear-block system, or screw-spline system, or head-and-sill-receptor system with shear blocks at intermediate horizontal members.
- F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
  - 1. At exterior door frames, provide compression weather stripping at fixed stops.
  - 2. At interior door frames, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

3. Fin-type door stops are not acceptable.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. Heavy Duty – Stile and Rail Construction (084113.A04): Aluminum standard doors shall be fabricated as previously specified.

2. Reinforce doors as required for installing entrance door hardware.

3. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.

4. At exterior doors, provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.9 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

## 2.10 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Prepare surfaces that are in contact with sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

### 3.3 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.

5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
  6. Seal perimeter and other joints watertight unless otherwise indicated.
  7. Completely fill gaps between shims and adjacent construction with loose fiberglass insulation or spray foam insulation.
- B. Metal Protection:
1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
  2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
1. Install two-piece snap trim with long leg oriented horizontally and short leg fastened to aluminum framing, so that trim cover is exposed, and trim clip is concealed. Secure trim to aluminum framing and adjacent construction in accordance with trim manufacturer's written instructions.
- E. Prior to installation of perimeter vertical members, install jamb closure membrane at cavity walls to cover gap/joint between interior and exterior substrates. Intent is to seal air cavity and joints between substrates. Extend membrane from interior face of framing/blocking to exterior. Trim membrane so that it will not be exposed to view after vertical members are set, and edge of membrane is terminated in sealant installed around perimeter of aluminum framing.
1. Seal tops of end dams at jambs to adjacent construction or extend jamb closure membrane over end dam to direct water into subsill in order to drain to exterior.
- F. Install glazing as specified in Section 088000 "Glazing."
- G. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
  2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

### 3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
  2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
  3. Alignment:
    - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
  4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
    - a. Perform tests in each test area as directed by Architect.
      - 1) For punched openings, test each window of installation, in each type of exterior finish substrate, unless noted otherwise.
      - 2) For storefront, and clerestories; test each installation, unless noted otherwise.
- C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 084113

## SECTION 087100 – DOOR HARDWARE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Intent: The intent of this Section is to provide finish hardware for the proper operation and control of all wood, hollow metal and aluminum doors in the Project. Prior to bidding, notify the Architect of any doors that do not have hardware meeting this intention.
- B. This Section includes items known commercially as finish or door hardware that are required for swinging doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed. This Section includes, but is not necessarily limited to furnishing and installing complete, the following:
  - 1. Finish hardware for proper operation and control of all wood, aluminum and hollow metal doors, including hinges, locks and latch sets, closers, panic devices, auto-flushbolts, electric strikes, magnetic holders, removable mullions, cylinders, keys, miscellaneous stops, flat goods, weatherstripping and thresholds as required.
  - 2. Cylinder for access doors where specified.
- C. Related work in other sections:
  - 1. Hollow metal doors, frames and silencers: Section 081113.
  - 2. Wood doors: Section 081416.
  - 3. Aluminum doors: Section 084113.

#### 1.2 DEFINITIONS

- A. "Finish Hardware" includes items known commercially as finish hardware which are required for swing, and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: Submit manufacturers technical product data for each hardware item. Include information necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finishes.
  - 1. Manufacturer shall submit written certification confirming closers compliance with U.L. 10C.
- B. Hardware Schedule: Submit a hardware schedule in a vertical format (horizontal format not acceptable), organized into sets, including the information below. Designations for door numbers and hardware sets in the schedule shall match those used in the Construction Documents for each opening.
  - 1. Hardware Schedule shall be coordinated with doors, frames, and related work to ensure proper size, thickness, hand function, and finish of door hardware.
  - 2. Catalog cuts of each type of exposed hardware unit, highlighted in color to indicate compliance with the Hardware Schedule.
  - 3. Type, style, function, size and finish of each hardware item.
  - 4. Name and manufacturer of each item.
  - 5. Fastenings and other pertinent information.
  - 6. Explanation of all abbreviations, symbols, codes, etc., contained in schedule.
  - 7. Mounting locations for hardware.
  - 8. Door and frame sizes and materials.
  - 9. Deviations from Specifications shall be noted in cover letter.
- C. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.
- D. Keying Schedule: Submit separate detailed schedule, at the same time as the Hardware Schedule, indicating keying for all locks and how Owner's instructions, on keying of locks has been fulfilled. Keying schedule must be approved before ordering any locks.

- E. Pinning Transcript: Submit detailed schedule indicating each lock cylinder and core.
- F. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
- B. Product/Material Qualifications: Manufacturer's product numbers are indicated for convenience in identifying finish hardware items. Unless otherwise indicated, manufacturer's description for indicated product number constitutes minimum standards of quality, design, function and performance required for each item to be incorporated into the Project.
  - 1. It will be the responsibility of the Bidder to furnish with his Bid a list clarifying any deviations from these specifications written or implied, in order that a fair and proper evaluation be made. Those Bidders not submitting a list of deviations will be presumed to have Bid as specified.
- C. Supplier Qualifications: A recognized Architectural Finish Hardware Supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of not less than 2 years. Supplier shall be or employ an experienced Architectural Hardware Consultant (AHC) who is certified by and member of the Door and Hardware Institute. The Architectural Hardware Consultant shall be available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor.
  - 1. Supplier shall meet with the Owner to finalize keying requirements and obtain final instructions in writing.
- D. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Pamphlets No. 80, No. 101 and of authorities having jurisdiction requirements. Provide only hardware which has been tested and listed by UL, FM or Warnock Hersey for types and sizes of doors required and complies with requirements of door and door frame labels.
  - 1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware".
- E. Standards: Comply with the requirements of the latest edition of the following standards, unless indicated otherwise:
  - 1. American National Standards Institute (ANSI) Publications:
    - a. A115 Series - Door and Frame Preparation.
    - b. A156 Series - Hardware.
  - 2. Builders Hardware Manufacturers Association (BHMA) Publications:
    - a. 1201 - Auxiliary Hardware.
    - b. 1301 - Materials and Finishes.
  - 3. Door and Hardware Institute (DHI) Publications:
    - a. Keying - Procedures, Systems, and Nomenclature.
    - b. Abbreviations and Symbols.
    - c. Hardware for Labeled Fire Doors.
    - d. Recommended Locations for Builder's Hardware for Standard and Custom Steel Doors and Frames.
    - e. Wood Door Standards W1, W2, WDHS-2, WDHS-3.
  - 4. National Fire Protection Association (NFPA) Publications:
    - a. NFPA Pamphlet No. 80 - Standards for Fire Doors and Windows.
  - 5. International Building Code - current edition adopted.
  - 6. Americans with Disabilities Act (ADA).
- F. Keying Conference: Conduct conference in accordance with Section 013100. In addition to Owner, Construction Manager, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
  - 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
  - 2. Preliminary key system schematic diagram.
  - 3. Requirements for key control system.
  - 4. Address for delivery of keys.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Section 013100 as follows:

1. Architectural Finish Hardware supplier (AFHS) shall conduct the preinstallation conference at the site. The AFHS shall instruct finish hardware installer on proper installation, adjustment and troubleshooting for each operable item of finish hardware specified. The AFHS shall observe the installation and adjustment of the first three locksets, closers and exit devices.

#### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Package each hardware item in separate containers with all screws, wrenches, installation instructions and installation templates. Mark or tag each box with hardware heading and door number according to approved hardware schedule.
- B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- C. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation. Provide a complete packing list showing items, door numbers and hardware headings with each shipment.
- D. Store hardware in shipping cartons above ground and under cover to prevent damage.
  1. Provide secure lockup for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.
- E. Aluminum Door Hardware: If required by door manufacturer deliver hardware for aluminum doors as directed by the door supplier for factory installation.

#### 1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, and building control system, as applicable.
- C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.
  1. Fire ratings of existing doors and frames are to be maintained, provide hardware accordingly.
  2. Provide fire rated hardware for rated doors as identified in door schedule. If existing condition requires new hardware to meet rating, provide accordingly.

#### 1.7 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

### PART 2 - PRODUCTS

#### 2.1 HARDWARE - GENERAL

- A. Provide the materials or products indicated by trade names, manufacturer's name, or catalog number.
- B. Provide manufacturer's standard products meeting the design intent of this Specifications, free of imperfections affecting appearance or serviceability.
  1. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.
  2. Provide hardware complete with all fasteners, anchors, instructions, layout templates, and any specialized tools as required for satisfactory installation and adjustment.

3. Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
  4. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated or approved. Finish screws exposed under any condition to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as
  5. Finish all other hardware in accordance with the BHMA finish as follows, unless otherwise indicated in manufacturers screws to secure hardware.
  6. Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work, except where indicated otherwise or where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex bolt fasteners.
  7. Provide factory pinned cylinders and cores.
- C. Hardware is specified in the hardware schedule by set, type, and functions which have been selected as best meeting the application requirements. Acceptable products for each category are specified under PART 2 of this Specification.

## 2.2 SPECIAL REQUIREMENTS

- A. Hinges:
1. Provide non-removable pins for all exterior doors and out-swinging corridor doors. Use nonrising pins for all other doors.
  2. Pre-drill pilot holes for hinge fasteners at factory to suit hinge type.
  3. Provide continuous hinges where specified.
- B. Locksets:
1. All locksets shall meet or exceed ANSI A156.13-94, Grade 1 requirements.
- C. Panic Devices:
1. All panic devices shall have touchbars made of stainless steel, provide devices in stainless finish where specified.
  2. All latchbolts are to be deadlatching.
- D. Closers:
1. Comply with manufacturer's recommendations for unit size based on door size, weather exposure and usage.
  2. Provide parallel arms for all overhead closers, except as otherwise indicated.
  3. All surface closers shall exceed ANSI A156.4 Grade 1 requirements in all aspects as called for below. All closers shall have certification by an independent testing laboratory of 10,000,000 cycles without failure. Provide special rust inhibitive primer (SRI) where specified.
  4. Furnish all brackets, drop plates and any other necessary hardware required to insure proper installation.
- E. Thresholds and Gasketing
1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
  2. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
  3. Gasketing and astragals on aluminum frames by door manufacturer.
- F. Silencers
1. Provide "push-in" type silencers for hollow metal or wood frames.
  2. Provide one silencer per 30 inches of height on each single frame, and two for each pair frame.
  3. Omit where gasketing is specified.

## 2.3 KEYING

- A. Cylinders shall be keyed to the districts existing Best master system. Hardware supplier to verify proper key system. Keying schedule must be approved by the Owner prior to ordering locks.
1. Hardware supplier shall be responsible for providing the correct type of cylinder for each hardware application, and supplying cylinder with correct tailpiece and/or cam.
  2. Provide locksets and cylinders with removable cores.
  3. Reuse existing cores where possible.



- B. Key all locks separately, or alike, as directed by the Owner's representative and Architect. D. Provide keys as follows:
  - 1. Change Keys: Two (2) per lock.
  - 2. Master Keys: Six (6) required (per system).
- C. Identification: Stamp all (master-type) keys with the following:
  - 1. Do Not Duplicate.
  - 2. Key change number (all keys).

#### 2.4 HARDWARE FINISHES

- A. Provide matching finishes for hardware units at each door to the greatest extent possible, unless otherwise indicated. In general, match items to the finish for the latch, lock or push-pull unit for color and texture.
  - a. Product description or schedule:
    - 1) 626 satin chrome-plated.
    - 2) 630 satin stainless steel.

#### 2.5 HARDWARE PRODUCTS

- A. Hinges:
  - 1. Specified manufacturer: IVES Hardware; an Allegion Company.
  - 2. Acceptable substitutions:
    - a. Hager Companies.
    - b. McKinney Products Company; an ASSA ABLOY Group company.
    - c. Stanley Commercial Hardware; Div. of The Stanley Works.
- B. Continuous Gear-Type Hinges:
  - 1. Specified manufacturer: IVES Hardware; an Allegion Company.
  - 2. Acceptable substitutions:
    - a. Hager Companies.
    - b. McKinney Products Company; an ASSA ABLOY Group company.
    - c. Select Products Limited.
- C. Locksets:
  - 1. Specified manufacturer: Best Lock.
  - 2. Substitutions: Not allowed. Products to match District standard.
- D. Exit Devices:
  - 1. Specified manufacturer: Von Duprin; an Allegion Company
  - 2. Substitutions: Not allowed. Products to match District standard.
- E. Closers:
  - 1. Specified manufacturer: LCN Closers; an Allegion Company.
  - 2. Substitutions: Not allowed. Products to match District standard.
- F. Flatgoods:
  - 1. Specified manufacturer: Ives Hardware; an Allegion Company.
  - 2. Acceptable substitutions:
    - a. Burns.
    - b. Rockwood.
- G. Stops:
  - 1. Specified manufacturer: Ives Hardware; an Allegion Company.
  - 2. Acceptable substitutions:
    - a. Burns Manufacturing Incorporated.
    - b. Hager Companies.
    - c. Rockwood Manufacturing Company.
    - d. Trimco
- H. Overhead stops:
  - 1. Specified manufacturer: Glynn-Johnson; an Allegion Company.
  - 2. Acceptable substitutions:
    - a. Architectural Builders Hardware Mfg., Inc.
    - b. Door Controls International.
    - c. Ives Hardware; an Allegion Company.

- d. Rixson Specialty Door Controls; an ASSA ABLOY Group.
  - e. Trimco.
- I. Thresholds:
    - 1. Specified manufacturer: Zero International
    - 2. Acceptable substitutions:
      - a. Pemko Manufacturing Co.
      - b. Reese Enterprises.
      - c. National Guard Products.
  - J. Door Gasketing:
    - 1. Specified manufacturer: Zero International
    - 2. Acceptable substitutions:
      - a. Pemko Manufacturing Co.
      - b. Reese Enterprises.
      - c. National Guard Products.
  - K. Weatherstripping:
    - 1. Specified manufacturer: Zero International
    - 2. Acceptable substitutions:
      - a. Pemko Manufacturing Co.
      - b. Reese Enterprises.
      - c. National Guard Products.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Carefully inspect doors, frames, and conditions under which hardware will be installed. Notify the Architect of any conditions that would adversely affect the installation or subsequent door operations. Do not proceed until unsatisfactory conditions are corrected.
  - 1. Frames shall be verified, inspected, and confirmed by General Contractor as being plumb and true.
- B. Refer to Sections 081113, 081416, and 084113 for additional installation requirements.
- C. Prior to hardware installation, the Hardware Supplier shall meet with the Owner's Representative, Architect, and Hardware Installer to ensure the Installer has and understands the manufacturers' installation requirements for all hardware items.
  - 1. The Supplier shall observe the installation of the first lockset, closer and panic device.

### 3.2 INSTALLATION

- A. Mount Hardware units at heights indicated in respective DHI Standards, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.
- B. Install each hardware item in compliance with the manufacturer's instructions and written recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be field finished, coordinate removal, storage and reinstallation or application of surface protections with finishing work. Do not install surface-mounted items until finishes have been completed on the substrate.
- C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
  - 1. Special care shall be taken to avoid damaging surrounding surfaces.
- D. Provide fasteners and anchoring devices of suitable size, quantity, and type to secure hardware in proper position for heavy use and long life.
  - 1. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Adjust door closers immediately upon installation. Adjust in exact conformance with manufacturer's printed instructions. Advance backcheck to eliminate shock at dead stop. Set latching speed to assure unassisted positive latching.
  - 1. Degrees of swing of doors for self-limiting closers shall be maximum available.

- F. Install each protection plate with a thinly-spread spot of mastic at its center to assure even contact before fastening with screws. Install all such plates on visual centers of closed doors. Set bottom edges of all such plates flush with door bottom.
- G. Cut and fit thresholds to door frame profiles. Prepare thresholds for the attachment of strikes and clearance for spindles as required. Set thresholds in a continuously laid bed of polyisobutylene mastic sealant to completely fill voids and exclude moisture from every source.
- H. Seal weather protection components attached to the exterior sides of doors and frames, such as drip caps and weatherstripping, in place with clear silicone caulk in such a manner as to ensure a continuously filled seam throughout the joinery.
- I. Cut and fit weatherstripping accurately to provide the greatest possible continuity of the contact element. Adjust closer templating as required.
- J. At exterior doors, obtain satisfactory operation of the installation, then apply a thin layer of clear silicone caulk under hinge leaves, and outside lock trim. Remove excess caulk after torquing fasteners.

### 3.3 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
  - 1. Clean adjacent surfaces soiled by hardware installation.
- B. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

### 3.4 INSTRUCTION AND INSPECTION

- A. Instruct Owner's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.
- B. After hardware is installed and adjusted, the Supplier shall inspect the job with the Architect and the Contractor to determine if the hardware is functioning properly.
  - 1. Maintain the instruction sheets, layout templates, and any supplementary literature regarding hardware in a readable condition. Transmit all such items to the Owner's Representative, together with all spare parts, specialized tools, other accessories supplied with the hardware, and a copy of the approved hardware schedule at the time of instruction.
- C. Continued Maintenance Service: Approximately six months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return to the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units at no cost to the Owner. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

HARDWARE SET: 01

DOOR NUMBER:

B116A                      B116B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	628	IVE
1	EA	REMOVABLE MULLION	KR4954	689	VON
1	EA	PANIC HARDWARE	99-DT	626	VON
1	EA	PANIC HARDWARE	99-NL	626	VON
1	EA	MORTISE CYLINDER	1E74 X VERIFY CAM	626	BES
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	MOUNTING PLATE	4040-18 (IF REQ'D)	689	LCN
2	EA	CUSH SHOE SUPPORT	4040-30 (IF REQ'D)	689	LCN
2	EA	BLADE STOP SPACER	4040-61 (IF REQ'D)	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	39A	A	ZER
2	EA	DOOR SWEEP	8197AA	AA	ZER
1	EA	THRESHOLD	65A-223	A	ZER
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	WEATHERSTRIP BY DOOR/FRAME MANUFACTURER			

HARDWARE SET: 02

DOOR NUMBER:

A119                      A119B                      A205

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	FIRE RATED REMOVABLE MULLION	KR9954	689	VON
2	EA	FIRE EXIT HARDWARE	99-L-F-06	626	VON
4	EA	RIM CYLINDER	1E72	626	BES
1	EA	MORTISE CYLINDER	1E74 X VERIFY CAM	626	BES
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	8150SBK PSA	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	MEETING STILE	8195AA	AA	ZER

NOTE: REUSE EXISTING SFIC CORE WHERE POSSIBLE. ADDITIONAL COMPONENTS MAY BE SALVAGED FROM EXISTING OPENING AND REINSTALLED AT DESCRETION OF CONTRACTOR.

HARDWARE SET: 03

DOOR NUMBER:

C150A                      C150B                      C150C                      C150D                      C151

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	FIRE RATED REMOVABLE MULLION	KR9954	689	VON
2	EA	FIRE EXIT HARDWARE	99-L-F-06	626	VON
2	EA	RIM CYLINDER	1E72	626	BES
1	EA	MORTISE CYLINDER	1E74 X VERIFY CAM	626	BES
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	8150SBK PSA	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	MEETING STILE	8195AA	AA	ZER

NOTE: REUSE EXISTING SFIC CORE WHERE POSSIBLE. ADDITIONAL COMPONENTS MAY BE SALVAGED FROM EXISTING OPENING AND REINSTALLED AT DESCRETION OF CONTRACTOR.

HARDWARE SET: 04

DOOR NUMBER:

C146C

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	99-L-F-06	626	VON
2	EA	RIM CYLINDER	1E72	626	BES
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	GASKETING	8150SBK PSA	BK	ZER

NOTE: REUSE EXISTING SFIC CORE WHERE POSSIBLE.

HARDWARE SET: 05

DOOR NUMBER:

A242A                      A242B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	FIRE RATED REMOVABLE MULLION	KR9954	689	VON
2	EA	FIRE EXIT HARDWARE	99-L-BE-F-06	626	VON
1	EA	MORTISE CYLINDER	1E74 X VERIFY CAM	626	BES
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	8150SBK PSA	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	MEETING STILE	8195AA	AA	ZER

NOTE: REUSE EXISTING SFIC CORE WHERE POSSIBLE. ADDITIONAL COMPONENTS MAY BE SALVAGED FROM EXISTING OPENING AND REINSTALLED AT DESCRETION OF CONTRACTOR.

HARDWARE SET: 06

DOOR NUMBER:

A112A C149 C154

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	LOCKSET	REUSE EXISTING		BES
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	GASKETING	8150SBK PSA	BK	ZER

NOTE: REUSE EXISTING SFIC CORE WHERE POSSIBLE.

HARDWARE SET: 07

DOOR NUMBER:

A218

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCKSET	93K7D 15D	626	BES
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	GASKETING	8150SBK PSA	BK	ZER

NOTE: REUSE EXISTING SFIC CORE WHERE POSSIBLE.

HARDWARE SET: 08

DOOR NUMBER:

A111 A112B A217 A219 C133 C135  
C153

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCKSET	93K7R 15D	626	BES
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	8150SBK PSA	BK	ZER

NOTE: REUSE EXISTING SFIC CORE WHERE POSSIBLE.

HARDWARE SET: 09

DOOR NUMBER:

A100A A116 A120 A211 B123 B248  
B263 C134

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	STOREROOM LOCKSET	93K7D 15D	626	BES
	EA	NOTE	REMAINDER OF HARDWARE SALVAGED AND REINSTALLED		

NOTE: REUSE EXISTING SFIC CORE WHERE POSSIBLE.

NOTE: VERIFY RATED DOORS HAVE AN EXISTING CLOSER. IF NOT PROVIDE APPROPRIATE CLOSER FOR APPLICATION.

HARDWARE SET: 10

DOOR NUMBER:

A104A            A105            A106A            A106B            A107A            B262  
 B264            C136

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CLASSROOM LOCKSET	93K7R 15D	626	BES
	EA	NOTE	REMAINDER OF HARDWARE SALVAGED AND REINSTALLED		

NOTE: REUSE EXISTING SFIC CORE WHERE POSSIBLE.

NOTE: VERIFY RATED DOORS HAVE AN EXISTING CLOSER. IF NOT PROVIDE APPROPRIATE CLOSER FOR APPLICATION.

HARDWARE SET: 11

DOOR NUMBER:

A101	A102	A104	A108	A110	A113
A114	A115	A121	A206	A210	A212
A214	A215	A269	A270	A271	A276
A276A	A277	A277A	B121	B235	B236
B237	B238	B252A	B252B	B252C	B260
B265	B266	B277	B278	C137	C138
C139	C140A	C140B	C142A	C142B	C142C
C145C	C145D	C146A	C146B	C152	C155

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	EA	NOTE	SALVAGE AND REINSTALL EXISTING HARDWARE		

DOOR / HARDWARE SET INDEX

Door #	HwSet #
A100A	09
A101	11
A102	11
A104	11
A104A	10
A105	10
A106A	10
A106B	10
A107A	10
A108	11
A110	11
A111	08
A112A	06
A112B	08
A113	11
A114	11
A115	11
A116	09
A119	02

Door #	HwSet #
A119B	02
A120	09
A121	11
A205	02
A206	11
A210	11
A211	09
A212	11
A214	11
A215	11
A217	08
A218	07
A219	08
A242A	05
A242B	05
A269	11
A270	11
A271	11
A276	11

Door #	HwSet #
A276A	11
A277	11
A277A	11
B116A	01
B116B	01
B121	11
B123	09
B235	11
B236	11
B237	11
B238	11
B248	09
B252A	11
B252B	11
B252C	11
B260	11
B262	10
B263	09
B264	10

Door #	HwSet #
B265	11
B266	11
B277	11
B278	11
C133	08
C134	09
C135	08
C136	10
C137	11
C138	11
C139	11

Door #	HwSet #
C140A	11
C140B	11
C142A	11
C142B	11
C142C	11
C145C	11
C145D	11
C146A	11
C146B	11
C146C	04
C149	06

Door #	HwSet #
C150A	03
C150B	03
C150C	03
C150D	03
C151	03
C152	11
C153	08
C154	06
C155	11

**END OF SECTION 087100**



## **SECTION 088000 - GLAZING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Windows.
  - 2. Doors.
  - 3. Storefront framing.
  - 4. Glazed entrances.
  - 5. Interior borrowed lites.
  - 6. Fire-protective glazing.
- B. Related Sections:
  - 1. Section 081113 "Hollow Metal Doors and Frames."
  - 2. Section 081416 "Flush Wood Doors".
  - 3. Section 084113 "Aluminum Entrances and Storefronts."

#### **1.2 DEFINITIONS**

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

#### **1.3 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM E 119: Fire Tests of Building Construction and Materials.
- B. American National Standards Institute (ANSI):
  - 1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings.
- C. Consumer Product Safety Commission (CPSC):
  - 1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials, Category II.

#### **1.4 PRECONSTRUCTION TESTING**

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.  
Submit the samples listing glass type corresponding to Glass Legend indicated on Drawings:
  1. Fire-resistive glazing products.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Preconstruction adhesion and compatibility test report.
- B. Qualification Data: For Installers.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Warranties: Sample of special warranties.

#### 1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

- D. Source Limitations for Glass: Obtain insulating glass from single source from single manufacturer for each glass type.
- E. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- F. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
  - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- G. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- H. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.
- I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- J. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Install glazing in mockups specified in Section 084113 "Aluminum-Framed Entrances and Storefronts" to match glazing systems required for Project, including glazing methods.

#### 1.9 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review temporary protection requirements for glazing during and after installation.
  - 3. Review drawings for locations and details of glazing.

#### 1.10 DELIVERY, STORAGE AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

#### 1.11 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

#### 1.12 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
  - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

### PART 2 PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:
  - 1. Design Wind Pressures: As indicated on Drawings.
  - 2. Design Snow Loads: As indicated on Drawings.

3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
  4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
  5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 GLASS PRODUCTS, GENERAL

- A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
1. Obtain tinted glass from single source from single manufacturer.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- C. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IgCC.
- E. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
1. Minimum Glass Thickness for Exterior Lites: 6.0 mm, except where specifically indicated otherwise.
- F. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- G. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.

2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.
6. Self-ignition temperature of 650 deg F or more when tested according to ASTM D 1929 on plastic sheets in thicknesses indicated for the Work.
7. Smoke-Developed Index of 450 or less when tested according to ASTM E 84, or smoke density of 75 or less when tested according to ASTM D 2843 on plastic sheets in thicknesses indicated for the Work.
8. Burning extent of 1 inch or less when tested according to ASTM D 635 at a nominal thickness of 0.060 inch or thickness indicated for the Work.

### 2.3 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
  1. Glass Types: Refer to Glass Type Schedule at end of this Section.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- D. Low-E-Coated Vision Glass: Coated by pyrolytic process or vacuum deposition (sputter-coating) process, and complying with other requirements specified.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide products listed below or comparable products from other manufacturers meeting specified requirements, and which are submitted to and accepted by Architect prior to bidding.
    - a. PPG Industries Inc.; "Solarban 70".
  2. Kind: Kind CV (coated vision glass).
  3. Glass: Clear and tinted float. Refer to Glass Types Schedule at end of this Section.
  4. Performance Criteria: Refer to Glass Types Schedule at end of this Section.

## 2.4 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
  - 1. Sealing System: Dual seal, with polyisobutylene and silicone, primary and secondary seals, respectively.
  - 2. Spacer: Aluminum with “black” anodic finish.
  - 3. Desiccant: Molecular sieve or silica gel, or blend of both.
- B. Glass Types: Refer to Glass Type Schedule at end of this Section.

## 2.5 FIRE-PROTECTION-RATED GLAZING (088000.A74)

- A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.
  - 1. “W” denotes installed locations that must meet wall assembly criteria per ASTM E119.
  - 2. “OH” denotes installed locations that must meet fire window assembly criteria per NFPA 257.
  - 3. “D” denotes installed locations that must meet fire door assembly criteria per NFPA 252.
  - 4. “H” denotes installed locations that must meet fire door assembly hose stream test per NFPA 252.
  - 5. “T” denotes installed locations that must meet temperature rise requirement per NFPA 252.

## 2.6 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
  - 1. EPDM complying with ASTM C 864.
  - 2. Silicone complying with ASTM C 1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM or silicone gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
  - 1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

## 2.7 GLAZING SEALANTS

- A. General:
  - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

## 2.8 GLAZING TAPES

- A. General: Provide glazing tapes that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.
- B. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- C. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
  2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.9 MISCELLANEOUS GLAZING MATERIALS

- A. General:
1. Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
  2. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.



- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

## 2.10 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.
  - 1. Provide ground and polished edges for glass doors.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Presence and functioning of weep systems.
  - 3. Minimum required face and edge clearances.
  - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

#### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- F. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.7 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

### 3.8 GLASS TYPE SCHEDULE - MONOLITHIC GLASS

- A. Glass Type 11 - Clear Fully Tempered monolithic float glass (088000.A11):
  - 1. 1/4 inch (6.0 mm).
  - 2. Provide safety glazing labeling.

### 3.9 INSULATING FULLY-TEMPERED GLASS SCHEDULE

- A. Glass Type 41 - Low-E-coated, clear insulating fully tempered glass (088000.A41)
  - 1. Overall Unit Thickness: 1 inch
  - 2. Minimum Thickness of Each Glass Lite: 6.
  - 3. Outdoor Lite: Fully tempered clear sputter-coated float glass.
  - 4. Basis-of-Design Product: Vitro Architectural Glass; Solarban 70.
  - 5. Interspace Content: Air.
  - 6. Indoor Lite: Fully tempered clear float glass.
  - 7. Low-E Coating: Sputtered on second surface.
  - 8. Visible Light Transmittance: 64 percent minimum.
  - 9. Visible Light Reflectance (Exterior): 10 to 12 percent.
  - 10. Winter Nighttime U-Factor: 0.28 (air) maximum.
  - 11. Solar Heat Gain Coefficient: 0.27 maximum.
  - 12. Light-to-Solar Gain Ratio (LSG): 2.30 minimum.
  - 13. Safety glazing required.

### 3.10 FIRE-PROTECTIVE 20-MINUTE RATED TEMPERED GLASS. (088000.A74)

- A. Glass Type 74 - Fire Protective 1/4-inch-thick, fire-protection-rated tempered glass, complying with testing requirements in 16 CFR 1201 for Category II materials. Non-heat conductive and 20-minute rating minimum. Fire protective label per IBC shall be D-20.

1. Basis of Design Product: Technical Glass Products; "Fireglass 20" comparable product meeting specified requirements.

END OF SECTION 088000



## **SECTION 092116 - NON-STRUCTURAL METAL FRAMING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings, bulkheads, soffits, and exterior soffits.
  - a. For spans exceeding 8 feet in any direction refer to Section 054000 for design requirements.
3. Grid suspension systems for gypsum board ceilings.

**B. Related Requirements:**

1. Section 012300 "Alternates" for description of alternates affecting work of this Section.
2. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; and ceiling joists. In addition, for all interior soffits and ceilings with an unsupported span in any direction exceeding 8 feet.

#### **1.2 ACTION SUBMITTALS**

**A. Product Data:** For each type of product.

1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."

#### **1.3 INFORMATIONAL SUBMITTALS**

- A. Code-Compliance Certification of Studs and Tracks:** Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association or the Steel Stud Manufacturers Association.
- B. Evaluation Reports:** For embossed steel studs and runners and firestop tracks, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

### **PART 1 PRODUCTS**

#### **2.1 PERFORMANCE REQUIREMENTS**

- A. Fire-Test-Response Characteristics:** For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated or where not specifically indicated, as specified below, according to ASTM E 119 by an independent testing agency acceptable to authorities having jurisdiction.
1. Provide fire-resistance-rated assemblies identical to those specified by reference to design designations in UL "Fire Resistance Directory" or in listing of other testing and agencies acceptable to authorities having

jurisdiction. Design designation from UL are minimum requirements. Where more stringent requirements are indicated or specified, the more stringent requirements shall take precedence.

- a. One Hour non-load bearing partitions: UL U 465.
  - b. Two Hour non-load bearing partitions: UL U 411.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Horizontal Deflection: For wall assemblies, limited to 1/360 of the wall height based on horizontal loading of 5 lbf/sq. ft..

## 2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
  2. Protective Coating: ASTM A 653/A 653M, G40 or coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.
- B. Studs and Runners (092116.A01): ASTM C 645. Use either steel studs and runners or embossed steel studs and runners.
1. Steel Studs and Runners:
    - a. Minimum Base-Metal Thickness: 0.0179 inch.
    - b. Provide 0.0329 inch minimum base metal thickness for studs and runners at walls indicated to receive tile, walls indicated to receive abrasion-resistant drywall, impact-resistant drywall, and at other locations indicated.
    - c. Depth: 3-5/8 inches, unless otherwise indicated.
  2. Embossed Steel Studs and Runners:
    - a. Minimum Base-Metal Thickness: 0.0147 inch.
    - b. Provide 0.025 inch minimum base metal thickness for studs and runners at walls indicated to receive tile, walls indicated to receive abrasion-resistant drywall, impact-resistant drywall, and at other locations indicated.
    - c. Depth: 3-5/8 inches, unless specifically indicated otherwise.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit over inside runner and one gauge heavier than gauge for wall construction indicated.
  2. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.



- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
  - 1. Minimum Base-Metal Thickness: 0.0296 inch.
- F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
  - 1. Depth: 1-1/2 inches.
  - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- G. Hat-Shaped, Rigid Furring Channels (092116.A02): ASTM C 645.
  - 1. Minimum Base-Metal Thickness: 0.0179 inch.
  - 2. Depth: 7/8 inch, unless specifically indicated otherwise.
- H. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
  - 1. Depth: 3/4 inch.
  - 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
  - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- I. Z-Shaped Furring (092116.A04): With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.
- J. Steel Column Furring System: Subject to compliance with requirements provide “LocTite – Fast Frame Column Framing System” or a comparable product submitted to and accepted by Architect prior to bidding.

### 2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- B. Hanger Attachments to Concrete:
  - 1. Anchors: Capable of sustaining a load equal to 5 times that imposed as determined by ASTM E488.
    - a. Type: Post installed, chemical anchor or post-installed, expansion anchor.
  - 2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges. Hot-dip galvanize carrying channels in exterior locations to at least G40 requirements.
  - 1. Depth: 2 inches.
- F. Furring Channels (Furring Members) (092116.A05):
  - 1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
  - 2. Steel Studs and Runners: ASTM C 645.
    - a. Minimum Base-Metal Thickness: 0.0179 inch.
    - b. Depth: 2-1/2 inches.
  - 3. Embossed Steel Studs and Runners: ASTM C 645.
    - a. Minimum Base-Metal Thickness: 0.0147 inch.
    - b. Depth: 2-1/2 inches.
  - 4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
    - a. Minimum Base-Metal Thickness: 0.0179 inch.
- G. Grid Suspension System for Gypsum Board Ceilings and Soffits: At Contractor's option, pre-manufactured grid suspension systems may be used. Grid suspension system shall comply with ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Armstrong World Industries, Inc; Drywall Grid Systems.
    - b. Chicago Metallic Corporation; 640/660 Drywall Ceiling Suspension.
    - c. United State Gypsum Company; Drywall Suspension System.

## 2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Vertical Isolation Strips at Exterior Walls: Provide one of the following:
  - 1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
- C. Isolation Strips beneath Runner Tracks at Exterior Walls: Provide the following:
  - 1. Polyethylene-sheet-backed rubberized asphalt membrane, 40 mils thick. Field cut to match widths of runners.
- D. Resilient Sound Isolation Clips: Subject to compliance with requirements, provide "RSIC-1" by PAC International or a comparable product submitted to and accepted by Architect prior to bidding with the following product characteristic.
  - 1. Rubber Isolator
    - a. Natural and Manufactured rubber compound
    - b. Molded to isolate ferrule from clip
    - c. Minimum of 12 micro-vibration controlling pedestal at point of contact with framing member.
    - d. Manufactured to ASTM D2000, M2 AA 510 A13, which includes:
      - 1) Hardness, ASTM D2240, Shore A: 47 min

- 2) Modulus 300 Percent, ASTM D412, Die C: 5.3 MPa.
- 3) Tensile Strength, ASTM D412, Die C: 11.2 MPa
- 4) Elongation at Break, ASTM D573: 454 percent.
- 2. Clip: Galvanized or aluminum-zinc coated steel, 16 gauge.
- 3. Ferrule: Zinc-electroplated steel.
- 4. Projection: 1-5/8 inches from supporting structure, when 7/8-inch drywall furring channels are used.
- E. Deck-Suspended Ceiling Hangers: Subject to compliance with requirements, provide Kinetics Noise Control; "ICC Deck-Supported Ceiling Isolation Hanger". Comparable products from other manufacturers will be considered.
  - 1. Hanger shall include a 1-inch rated deflection spring in series with a neoprene cup.
  - 2. Hanger shall be equipped with a clip/leveling rod assembly, designed to receive a 16 gauge steel carrying channel.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
  - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
  - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
  - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

### 3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
  - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
  - 2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
  - 3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Where runner tracks for exterior walls are installed directly against concrete or dissimilar metals, install rubberized asphalt isolation strips between bottom of runner track and concrete.
- D. Install studs so flanges within framing system point in same direction.
- E. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs, having a minimum base metal thickness of 0.0296 inches, at each jamb.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
  - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
    - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
  - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

F. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

G. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

H. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

### 3.5 INSTALLING SOUND ISOLATION CLIPS AND CEILING HANGERS

A. Install ceiling hangers, resilient sound isolation clips and drywall furring channels in accordance with manufacturer's written instructions.

1. Locate resilient sound isolation clips maximum of 8 inches from ends of dry wall furring channels.

B. Mechanically fasten resilient sound isolation clips to structure with screws, bolts, or expansion anchors, dependent upon structure.

C. Fire-Resistive Design Assemblies:

1. Install as specified in UL Fire Resistance Directory, where required.
2. Do not arbitrarily add resilient sound isolation clips to fire-rated assemblies.

D. Space resilient sound isolation clips at maximum of 24 inches by 48 inches on center for walls and ceilings.

E. Do not exceed design load (pull and shear) of 36 pounds per isolation clip.

F. Stagger isolation clip installation, so dead load is supported by all support members.

G. Space ceiling hangers as recommended by manufacturer.

1. Do not exceed design load (pull and shear) of ceiling hanger.

H. Splicing Drywall Furring Channels:

1. Splice drywall furring channels with minimum of 6-inch (150-mm) laps.
2. Secure laps with 2 framing screws or 18 gauge tie wire double wrapped.
3. Locate splices between resilient sound isolation clips.
4. Do not locate splices on resilient sound isolation clips.

- I. Install resilient sound isolation clips on 1 side of wall assembly, unless otherwise indicated on the drawings.
- J. Flanking Noise:
  - 1. Review installation details to prevent structure-borne flanking noise.
  - 2. Do not allow drywall furring channels or gypsum board to contact foreign materials, including floors, ceilings, or wall framing members.
- K. Ensure metal ferrule of resilient sound isolation clips is in firm contact with structural member.
- L. Gypsum Board:
  - 1. Install gypsum board in vertical or horizontal position with 1/8-inch to 1/4-inch gap around perimeter for acoustical sealant application.
  - 2. Install gypsum board in accordance with ASTM C 840 as specified in Section 092900.
- M. Acoustical Sealant:
  - 1. Seal potential air leaks with acoustical sealant to achieve best Field Sound Transmission Class (FSTC).
  - 2. Seal electrical outlets and penetrations with acoustical sealant.
  - 3. Apply fire-rated acoustical sealant at locations where fire-rated assembly is required.
- N. Putty Pad Sealant: Acoustically seal with putty pads, electrical boxes in walls and ceilings in which resilient sound isolation clips are used.

### 3.6 INSTALLING SUSPENSION SYSTEMS

- A. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Hangers: 48 inches o.c.
  - 2. Carrying Channels (Main Runners): 48 inches o.c.
  - 3. Furring Channels (Furring Members): 16 inches o.c.
- B. Suspend hangers from building structure as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
    - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  5. Do not attach hangers to steel roof deck.
  6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
  8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- C. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092116





## **SECTION 092900 - GYPSUM BOARD**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Interior gypsum board.
  - a. Gypsum Board, Type X (092900.A02)
2. Acoustical sealant for sound control assemblies.
3. Expansion control joint (092900.A12).

**B. Related Requirements:**

1. Section 012300 "Alternates" for description of alternates effecting work of this Section.
2. Section 061600 "Sheathing" for gypsum sheathing for exterior walls and for cement board.
3. Section 092116 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
4. Division 26 Sections for electrical connections to lighting components within trim pieces.

#### **1.2 ACTION SUBMITTALS**

**A. Product Data:** For each type of product.

**B. Samples:** For the following products:

1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

**C. Samples for Verification:** For the following products:

1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

#### **1.3 QUALITY ASSURANCE**

**A. Integrated Field Sample:** Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build integrated field sample for the following:
  - a. Each level of gypsum board finish indicated for use in exposed locations.
  - b. Each texture finish indicated.
2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

#### 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

### PART 2 PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

#### 2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

#### 2.3 INTERIOR GYPSUM BOARD

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
  - 1. American Gypsum.
  - 2. CertainTeed Corp.
  - 3. Lafarge North America, Inc.
  - 4. National Gypsum Company.
  - 5. USG Corporation.
- B. Gypsum Board, Type X (092900.A02): ASTM C 1396/C 1396M.
  - 1. Thickness: 5/8 inch.

2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

## 2.4 TRIM ACCESSORIES

### A. Interior Trim (092900.A11): ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
  - a. Where trim is indicated as SLT, provide structural laminate drywall corner system using "No-Coat" products as manufactured by Certainteed or a comparable product submitted to and accepted by Architect prior to bidding.
    - 1) At Contractor's option, all interior corner trim may be structural laminate drywall corner system.
2. Shapes:
  - a. Cornerbead.
  - b. L-Bead: L-shaped; exposed long flange receives joint compound.
  - c. U-Bead: J-shaped; exposed short flange does not receive joint compound.
  - d. Expansion (control) joint.
  - e. Wall end cap: Provide "Fast Cap" as manufactured by Trim-Tex Drywall Products.

## 2.5 JOINT TREATMENT MATERIALS

### A. General: Comply with ASTM C 475/C 475M.

### B. Joint Tape:

1. Interior Gypsum Board: Paper.

### C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.
  - a. Where specifically indicated on Drawings, provide a setting-type, sandable topping compound for trowel-applied skim coat.

## 2.6 AUXILIARY MATERIALS

### A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

### B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

### C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

- D. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."
- E. Sound-Attenuation Blankets (092900.A14): ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
  - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
  - 2. Recycled Content of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- F. Acoustical Impaling clips (092900.A14): Galvanized sheet metal impaling clips each with 8 spikes that stick onto the fiberglass and hold the panel in place; 2-1/8" x 1-1/2"; install by either drywall screws or attached with adhesive as recommended by the manufacturer.
- G. Acoustical Joint Sealant (092900.A15): Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following products or a comparable product, with the following product characteristics, submitted to and accepted by Architect prior to bidding.
    - a. Accumetric LLC.; BOSS 824 Acoustical Sound Sealant.
    - b. Pecora Corporation.; AIS-919.
    - c. USG Corporation.; SHEETROCK Acoustical Sealant.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of

framed openings.

- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
  - 4. Where ceilings in showers abut adjacent walls, Provide 1/4- to 3/8-inch-wide spaces and trim edges with plastic edge trim to allow for sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Type X: Vertical and horizontal surfaces of walls, soffits, bulkheads and ceiling surfaces unless otherwise indicated.
- B. Single-Layer Application:
  - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
  - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

- a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
  - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints.

Locate edge joints over furring members.

4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

### 3.4 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11

1. Locations:
  - a. At shower ceiling locations and vertical surfaces indicated to receive tile
  - b. At showers, tubs, and where indicated
  - c. At locations indicated to receive tile.

- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

### 3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners.
  2. L-Bead: Use where indicated.

- 3. U-Bead: Use at exposed panel edges.
- D. Interior Trim – Structural Laminate: Provide at all outside corners (SLT) within 8'-0" of floor surface.
- E. Aluminum Trim: Install in locations indicated on Drawings.

### 3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in other Division 09 Sections.
  - 3. Level 5:
    - a. Provide at the following locations:
      - 1) At walls perpendicular to exterior glazing
      - 2) Where indicated on Drawings.
    - b. Primer and its application to surfaces are specified in Other Division 09 Sections.

### 3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900





## **SECTION 095113 - ACOUSTICAL PANEL CEILINGS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section includes:**

1. Acoustical ceiling panels (095113.A01).
2. Ceiling suspension systems (095113.A02).
3. Edge Molding and Trim (095113.A03).

**B. Related Requirements:**

1. Section 012300, "Alternates" for alternates effecting work of this section.

#### **1.2 PRE-INSTALLATION MEETINGS**

- A. Pre-installation Conference:** Conduct conference at Project site.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data:** For each type of product.

- B. Samples:** For each exposed product and for each color and texture specified.

- C. Samples for Verification:** For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: One 6 inch square Sample of each type, color, pattern, and texture.
2. Decorative Edge Trim: One 6 inch long Sample of each type, finish, and color. Include splice plate and attachment clip.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings:** Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Size and location of initial access modules for acoustical panels.
4. Items penetrating finished ceiling including the following:
  - a. Lighting fixtures.
  - b. Air outlets and inlets.
  - c. Speakers.
  - d. Sprinklers.
  - e. Access panels.
5. Perimeter moldings.

- B. Installer Qualifications:** Submit written certification of compliance with requirements.

- C. Qualification Data:** For testing agency.

- D. Evaluation Reports: For each acoustical panel ceiling suspension system, from ICC-ES.
- E. Product test reports.
- F. Field quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Acoustical Ceiling Panels: Furnish two, un-opened boxes of each type installed.
  - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
  - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.
  - 4. Impact Clips: Equal to 2 percent of quantity installed.
  - 5. Single Tee Adapter Clips: Equal to 2 percent of quantity installed.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Firm with not less than three years of successful experience in installation of acoustical ceilings similar to requirements for this project and which is acceptable to manufacturer of acoustical units, as shown by current written statement from manufacturer.
- B. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Section 01 31 00.
- C. Testing Agency Qualifications: Qualified according to NVLAP.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

#### 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
  - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

## PART 2 PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Ceiling products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
  - 2. Smoke-Developed Index: 50 or less.

### 2.2 ACOUSTICAL PANEL CEILINGS, GENERAL

- A. Source Limitations:
  - 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
  - 2. Suspension System: Obtain each type from single source from single manufacturer.
- B. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- C. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
  - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.
- D. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
  - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- E. Metal Suspension System Standard: Comply with ASTM C 635.

### 2.3 ACOUSTICAL PANELS (095113.A01)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product specified hereinafter or comparable product, meeting specified requirements, by one of the following:
  - 1. Acoustical Ceiling Units:
    - a. Armstrong World Industries, Inc.
    - b. CertainTeed Corp. / Ecophon.
    - c. USG Interiors, Inc.; Subsidiary of USG Corporation.
  - 2. Metal Suspension Systems, Edge Moldings and Decorative Edge Trim:
    - a. Armstrong World Industries, Inc.
    - b. CertainTeed Corp.

- c. Chicago Metallic Corporation.
  - d. Gordon, Inc.
  - e. USG Interiors, Inc.; Subsidiary of USG Corporation.
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as specified.
- C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

## 2.4 ACOUSTICAL CEILING PANELS

- A. Acoustical Ceiling Panel, (095113.A01 – CLG1): Provide medium textured, square edge lay-in, mineral fiber ceiling panels with the following characteristics:
1. ASTM E 1264 Classification: Type III, Form 2, Pattern C,D.
  2. Size: 24" x 48" x 5/8".
  3. Color: White.
  4. Average light reflectance (LR): 0.82.
  5. Noise reduction coefficient (NRC): 0.55, minimum.
  6. Articulation class (AC): 180.
  7. Flame Spread/Fire Resistance: Class A with Fire Guard.
  8. Humidity Resistance: HumiGuard+ or comparable from other listed manufacturers.
  9. Product warranty: 30 years.
  10. Suspension grid type: 15/16.
  11. Basis of Design Product: Provide Armstrong "Cortega", #823, or comparable products from manufacturers listed in Article 2.3 of this Section.
- B. Acoustical Ceiling Panel, (095113.A01 – CLG2): Provide smooth textured, square edge lay-in, mineral fiber ceiling panels with the following characteristics:
1. ASTM E 1264 Classification: Type: XII, Form: 2, Pattern: E
  2. Size: 24" x 48" x 3/4".
  3. Color: White.
  4. Light reflectance 88%.
  5. Sound Absorption (NRC): 0.90.
  6. Flame Spread/Fire Resistance: Class A.
  7. Humidity Resistance: HumiGuard+ or comparable from other listed manufacturers.
  8. Product warranty: 30 years.
  9. Suspension grid type: Square Lay-In 15/16.

10. Surface Finish: Factory-applied latex paint on DuraBrite acoustically transparent membrane
11. Basis of Design Product: Provide Armstrong "Optima", #3151, or comparable products from manufacturers listed in Article 2.3 of this Section.

## 2.5 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content for Suspension Grid: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
- B. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
  1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
  1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
    - a. Type: Post-installed expansion anchors.
    - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
  2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
  1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, provide not less than 0.106-inch-diameter wire.
- E. Hanger Rods and Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. Hold-Down Clips for Non-Fire-Resistance-Rated Ceilings: For vestibule and corridor ceilings adjacent to exterior doors, provide hold-down clips spaced 2'-0" o.c. on all cross-tees for a radius of 10 feet from center of door.
- G. Impact Clips: In all toilet provide manufacturer's standard impact clip system design to absorb impact forces against lay-in panels.

- H. Hemmed Edge Molding: Provide prefinished edge molding of profiles indicated. Finish to match adjacent suspension grid.
- I. Fixture Trim: Provide manufacturer's standard fixture trim for fixtures within the 4 by 4 ceiling panels.
  - 1. Color to match suspension trim.

## 2.6 METAL SUSPENSION SYSTEM (095113.A02)

- A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; pre-painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished 15/16-inch- wide metal caps on flanges.
  - 1. Structural Classification: Intermediate-duty system.
  - 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
  - 3. Face Design: Flat, flush.
  - 4. Cap Material: Steel cold-rolled sheet, except in kitchen and food preparation areas provide aluminum.
  - 5. Cap Finish: As indicated on Material Finish Legend.

## 2.7 METAL EDGE MOLDINGS AND TRIM (095113.A03)

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
  - 1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
  - 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
  - 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- B. Basis of Design Product of Transition Molding: Subject to compliance with requirements provide "DONN Brand SL DXT" by USG Interiors, Inc.; Subsidiary of USG Corporation No Substitutions Allowed.
  - 1. Product number: CPDWA9120.
    - a. Reveal: 3/8" x 3/8".

## 2.8 DECORATIVE METAL EDGE MOLDINGS AND TRIM (095113.A04)

- A. Basis-of-Design Products: Subject to compliance with requirements, provide Armstrong, "Axiom Classic Trim - Straight" or comparable products by one of the following:
  - 1. CertainTeed Corporation.
  - 2. Chicago Metallic Corporation.

3. Fry Reglet Corporation.
  4. Gordon, Inc.
  5. USG Interiors, Inc.; Subsidiary of USG Corporation.
- B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips and complying with seismic design requirements and the following:
1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
    - a. Where indicated on Drawings, curve trim to match approved shop drawings.
  2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  3. Color: As selected by Architect from manufacturer's standard range.
  4. Depth: 6 inches, unless indicated otherwise.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

### 3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
  6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  8. Do not attach hangers to steel deck tabs.
  9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
  11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.
1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.
- D. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed



anchors.

- E. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
  - 1. At areas indicated, apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  - 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
  - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim, unless acceptable to Architect.
- F. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- G. Install decorative edge trim at locations and in configurations indicated. Install in accordance with trim manufacturer's written instructions and approved shop drawings.
- H. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
  - 1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
  - 2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
  - 3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
  - 4. Hold-Down Clips for Non-Fire-Resistance-Rated Ceilings: For vestibule ceilings adjacent to exterior doors, provide hold-down clips spaced 2'-0" o.c. on all cross-tees for a radius of 10 feet from center of door.
  - 5. Impact Clips: In all toilet and locker rooms, provide manufacturer's standard impact clip system design to absorb impact forces against lay-in panels.

### 3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.  
  
Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113



## **SECTION 096513 - RESILIENT BASE AND ACCESSORIES**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Resilient base (096513.A01 - RB1, RB2).
2. Resilient molding accessories (096513.A06 - RB5).
3. Resilient stair tread and riser (096513.A04 - RS1).

**B. Related Requirements:**

1. Section 012300, "Alternates" for alternates effecting work of this section.
2. Section 033000 "Cast-in-Place Concrete."

#### **1.2 ACTION SUBMITTALS**

**A. Product Data:** For each type of product.

**B. Samples for Initial Selection:** For each type of product indicated.

**C. Samples for Verification:** For each type of product indicated and for each color, texture, and pattern required in manufacturers' standard-size Samples, but not less than 12 inches long.

#### **1.3 MAINTENANCE MATERIAL SUBMITTALS**

**A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.**

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

**A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.**

#### **1.5 FIELD CONDITIONS**

**A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:**

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

**B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.**

- C. Install resilient products after other finishing operations, including painting, have been completed.

## PART 2 PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

### 2.2 THERMOPLASTIC-RUBBER BASE (096513.A01 – RB1, RB2)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Johnsonite; Traditional Wall Base or comparable products, meeting specified requirements, which are submitted to and accepted by Architect prior to bidding.
- B. Product Standard: ASTM F 1861, Type TP (thermoplastic).
  - 1. Group: I (solid, homogeneous).
    - a. RB1 and RB2: Style, Cove: Refer to Material Finish Legend for locations.
- C. Product Characteristics:
  - 1. Thickness: 0.125 inch.
  - 2. Height:
    - a. RB1: 6 inches as indicated on Drawings.
    - b. RB2: 4 inches as indicated on Drawings.
  - 3. Lengths: Coils in manufacturer's standard length.
  - 4. Outside Corners: Job formed.
  - 5. Inside Corners: Job formed.
  - 6. Colors: Refer to Material Finish Legend for colors.

### 2.3 RESILIENT STAIR TREAD/RISER/STRINGER UNITS

- A. Stair Tread Units with Integral Risers (096513.A04 – RB3): ASTM F 2169.
  - 1. Type: TS
  - 2. Class: 1 and 2.
  - 3. Group: Refer to Material Finish Legend.
  - 4. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
  - 5. Nosing Length: 1 9/16 inch.
  - 6. Thickness: 5/64 inch.
  - 7. Size: Lengths and depths to fit each stair tread in one piece or, for treads exceeding maximum lengths manufactured, in equal-length units.
  - 8. Integral Risers: Smooth, flat; in height that fully covers substrate.
  - 9. Stringers: 0.080 inches thick rubber, smooth, 12 inches high.

10. Landings: provide floor tile on landings to match treads, unless otherwise indicated.
11. Colors and Patterns: As indicated by manufacturer's designations on Material Finish Legend.
12. Basis-of-Design Product: Subject to compliance with requirements, provide Roppe; "Rubber Stair Treads with Integral Riser, #96 raised circular vantage design tread and riser. Comparable products from other manufacturers meeting specified requirements will be considered when submitted to and accepted by Architect prior to bidding.

## 2.4 RUBBER MOLDING ACCESSORIES

### A. Carpet to Concrete Transition Molding (096513.A06 - TR1):

1. Basis of Design: Subject to compliance with requirements, provide "1.2 RENO-U" by Schluter or a comparable product with the following product characteristics submitted to and accepted by Architect prior to bidding.
2. Product Characteristics:
  - a. Description: Reducer strips for carpet to concrete and resinous flooring to concrete flooring transitions.
  - b. Locations: Provide at areas indicated on Drawings.
  - c. Color and Patterns: As indicated on Interior Material Finish Legend.

### B. Carpet to Concrete Transition Molding (096513.A06 - TR2):

1. Basis of Design: Subject to compliance with requirements, provide "1.3 RENO-T" by Schluter or a comparable product with the following product characteristics submitted to and accepted by Architect prior to bidding.
2. Product Characteristics:
  - a. Description: Reducer strips for carpet to concrete and resinous flooring to concrete flooring transitions.
  - b. Locations: Provide at areas indicated on Drawings.
  - c. Color and Patterns: As indicated on Interior Material Finish Legend.

## 2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
  1. Adhesives shall have a VOC content of 50 g/L or less.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere

with adhesion of resilient products.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the space where they are to be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

### 3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
  - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
    - a. Form without producing discoloration (whitening) at bends.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
    - a. Miter or cope corners to minimize open joints.

### 3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

### 3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

- B. Perform the following operations immediately after completing resilient-product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum horizontal surfaces thoroughly.
  - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513





## **SECTION 096519 - RESILIENT TILE FLOORING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes resilient tile flooring (096519.A01) of the following types:
  - 1. Vinyl composition floor tile.
- B. Related Sections:
  - 1. Section 012300 "Alternates" for those alternates related to work of this Section.
  - 2. Section 096513 "Resilient Base and Accessories" for related base and floor transitions.
  - 3. Section 096813 "Tile Carpeting" for related flooring.

#### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
  - 1. Show details of special patterns.
- C. Samples for Verification: Full-size units of each color and pattern of floor tile required.

#### **1.3 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For Installer.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

#### **1.5 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Tile: Furnish one un-opened box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

#### **1.6 QUALITY ASSURANCE**

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
  - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.
- B. Mockups/Field Samples: Build mockups/field samples to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockups/field samples for floor tile including resilient base and accessories.

- a. Size: Minimum 50 sq. ft. for each type, color, and pattern in locations directed by Architect.
2. Approval of mockups/field samples does not constitute approval of deviations from the Contract Documents contained in mockups/field samples unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.  
Store floor tiles on flat surfaces.

#### 1.8 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
  1. 48 hours before installation.
  2. During installation.
  3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

### PART 2 PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

#### 2.2 VINYL COMPOSITION FLOOR TILE (096519.A01 – RF1)

- A. Basis of Design Product: Subject to compliance with requirements, provide.; Armstrong World Industries, Inc. "Standard Excelon" or comparable product meeting specified requirements and color indicated from one of the following:
  1. Congoleum Corporation.
  2. Mannington Mills, Inc.
  3. Tarkett/Azrock.
  4. Tile Standard: ASTM F 1066.

- a. 1. Class: Class I (solid color) and Class 2 (through pattern).
5. Product Characteristics:
  - a. Thickness: 0.125 inch.
  - b. Wearing Surface: Smooth.
  - c. Size: Refer to Material Finish Legend.
  - d. Edges: Square edged (SE).
  - e. Colors and Patterns: Refer to Material Finish Legend.

## 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.
- D. Topical Concrete Vapor Sealer: Liquid penetrating type or film-forming type, designed to seal concrete and inhibit moisture transmission through slab. Concrete vapor sealers shall be as recommended by resilient tile flooring contractor based upon successful previous installations and as acceptable to resilient tile flooring manufacturer.  
Refer to Section 012200 "Unit Prices".

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by carpet tile manufacturer. Do not use solvents.
  3. Alkalinity and Adhesion Testing: Perform tests recommended by carpet tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in

writing, but not less than 5 or more than 9 pH.

4. Moisture Testing (Contractor's Option):

- a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours, unless a higher rate is accepted by flooring manufacturer in writing.
    - 1) Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than two tests in each installation area and with test areas evenly spaced in installation areas.
  - b. Perform relative humidity test using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 80 percent relative humidity level measurement, unless a higher rate is acceptable to flooring manufacturer.
- C. Concrete Vapor Sealer Application: Prepare surfaces to receive concrete vapor sealer and apply concrete vapor sealer in strict accordance with vapor sealer manufacturer's written instructions to suit slab moisture conditions encountered.
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- E. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
- F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

### 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  1. Lay tiles square with room axis, unless specifically indicated otherwise.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive

spreader marks, and other surface imperfections.

### 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
  - 1. Apply two coats.
- E. Cover floor tile until Substantial Completion.

END OF SECTION 096519



## **SECTION 096653 - CEMENT TERRAZZO**

### CEMENT TERRAZZO

#### 1.1 SUMMARY

A. Section includes:

1. Cement terrazzo cleaning.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

#### 1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

#### 1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A terrazzo installer with not less than 7 years successful terrazzo restoration and patching of similar complexity to that required for the Project and certified to install the NeverStrip Terrazzo Seal product.

B. Mockup/Field Samples: The Owner/Architect will indicate a test area to define the level of acceptable finished work.

#### 1.5 FIELD CONDITIONS

A. Environmental Limitations: Maintain temperature above 50 deg F for 48 hours before, during and at least 48 hours after terrazzo installation.

B. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

#### 1.6 WARRANTY

A. Manufacturer/Installer shall warrant installed system/cleaned areas for a period of one (1) year from date of Substantial Completion against failure of workmanship and materials.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS AND PRODUCTS

A. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.

B. Basis-of-Design Products for Sealing honed and polished terrazzo: Subject to compliance with requirements, provide products from one of the following:

1. NeverStrip Terrazzo Seal (NSTS).
2. Comparable products from other manufacturers will be considered when submitted to and accepted by Architect prior to bidding.

## 2.2 MATERIALS FOR TERRAZZO REPAIR

- A. Portland Cement: ASTM C 150, Type 1.
  - 1. Color for Exposed Matrix: As required by mix indicated.
- B. Water: Potable.
- C. Aggregates: ASTM C 33/C 33M, cleaned and properly graded to size. Aggregates shall be blended to match existing areas as indicated on the drawings. Size and pattern to be approved by architect.
  - 1. Aggregates: Comply with NTMA gradation standards for mix indicated and contain no deleterious or foreign matter.
    - a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131.
    - b. 24-Hour Absorption Rate: Less than 0.75 percent.
    - c. Dust Content: Less than 1.0 percent by weight.
- D. Matrix Pigments: Pure mineral or synthetic pigments, alkali resistant, durable under exposure to sunlight, and compatible with terrazzo matrix.
- E. Aggregate for Tile: Provide natural, sound, crushed marble, stone, or porcelain chips without excessive flats or flakes complying with NTMA requirements.
  - 1. Matrix Pigments: Pure mineral or synthetic non-fading pigments, resistant to alkalis.
  - 2. Tile shall have at least 70 percent coverage of the precast terrazzo tile face with aggregate.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine existing terrazzo areas to receive hone and polish process. Document existing conditions with photographs. The intent is to restore the existing finish on the terrazzo not expose additional aggregate.

### 3.2 PREPARATION

- A. Prepare and protect adjacent existing areas.
  - 1. Erect and maintain temporary enclosures and other suitable methods to limit water damage and dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.
- B. Areas to be honed and polished must be clean and free of topical finish prior to being honed and polished.\

### 3.3 RESTORATION

- A. Comply with NTMA's written recommendations.
- B. Restore the existing terrazzo surfaces and shine with a mechanical hone and polish process including floors, corners, edges, treads and risers.
- C. Clean terrazzo surfaces thoroughly after the hone and polish process

### 3.4 PROTECTION

- A. Sealing:



1. Apply two coats of NeverStrip Terrazzo Seal (NSTS) to all cleaned terrazzo surfaces.
  2. Apply sealer according to sealer manufacturer's written instructions.
- B. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION 096653



## **SECTION 096813 - TILE CARPETING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes modular carpet tile (096813.A01).
- B. Related Requirements:
  - 1. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

#### **1.2 PRE-INSTALLATION MEETINGS**

- A. Pre-installation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
    - a. Review delivery, storage, and handling procedures.
    - b. Review ambient conditions and ventilation procedures.
    - c. Review subfloor preparation procedures.
    - d. Review carpet tile layout and patterns.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
  - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
  - 2. Include installation recommendations for each type of substrate.
- B. Shop Drawings: Show the following:
  - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
  - 2. Type of substrate to receive tile carpeting.
  - 3. Type of installation.
  - 4. Pattern of installation.
  - 5. Pattern type, location, and direction.
  - 6. Carpet tile type, color and dye lot.
  - 7. Type, color and location of insets and borders.
  - 8. Type, color and location of edge, transition, and other accessory strips.
  - 9. Transition details to other flooring materials.
- C. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
  - 1. Carpet Tile: Full-size Sample.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

E. Sustainable Product Certification: Provide ANSI/NSF 140 certification for carpet products.

#### 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Furnish one un-opened box of each carpet tile type, color and pattern for every 5 percent of amount installed.

#### 1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

C. Mockups/Field Samples: Build mockups/field samples to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups/field samples for carpet tile including accessories.
  - a. Size: Minimum 50 sq. ft. for each type, color, and pattern in locations directed by Architect.
2. Approval of mockups/field samples does not constitute approval of deviations from the Contract Documents contained in mockups/field samples unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Carpet and Rug Institute's CRI 104.

#### 1.9 FIELD CONDITIONS

A. Comply with the Carpet and Rug Institute's CRI 104 for temperature, humidity, and ventilation limitations.

- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

#### 1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
  - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
  - 3. Warranty Period: 10 years from date of Substantial Completion.

#### PART 2 PRODUCTS

##### 2.1 CARPET TILE (096813.A01)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products specified on drawings or a comparable products meeting specified requirements, having similar colors and patterns as acceptable to Architect with the following characteristics submitted to and accepted by Architect prior to bidding.
  - 1. Refer to Material Finish Legend for carpet selections including name, manufacturer, and installation pattern.
- B. Carpet Type C1: Subject to compliance with requirements, provide #163270AK00 by Interface
  - 1. Product Construction: Tufted Textured Loop.
  - 2. Fiber Type: 100 percent Recycled Content Nylon.
  - 3. Tufted Yarn Weight: 17 oz/sy.
  - 4. Pile Thickness: 0.101 inches.
  - 5. Pile Density: 6,0 oz/yd.
  - 6. Stitches: 9 per inch.
  - 7. Radiant Panel: ASTM E-648 Class 1.
  - 8. Smoke Density: ASTM E-662  $\leq$  450.
  - 9. Preservative Protection: Intersept.
  - 10. Soil / Stain Protection: Manufacturer's standard with warranty.

11. Color and Pattern: As indicated on Material Finish Legend.
  12. Installation Method: As indicated on Material Finish Legend.
- C. Carpet Type C2: Subject to compliance with requirements, provide #163230AK00 by Interface
1. Product Construction: Tufted Textured Loop.
  2. Fiber Type: 100 percent Recycled Content Nylon.
  3. Tufted Yarn Weight: 16 oz/sy.
  4. Pile Thickness: 0.09 inches.
  5. Pile Density: 6,400 oz/yd.
  6. Stitches: 8.3 per inch.
  7. Radiant Panel: ASTM E-648 Class 1.
  8. Smoke Density: ASTM E-662  $\leq$  450.
  9. Preservative Protection: Intersept.
  10. Soil / Stain Protection: Manufacturer's standard with warranty.
  11. Color and Pattern: As indicated on Material Finish Legend.
  12. Installation Method: As indicated on Material Finish Legend.
- D. Carpet Type C3: Subject to compliance with requirements, provide #138830AK00 by Interface
1. Product Construction: Tufted Textured Loop.
  2. Fiber Type: 100 percent Recycled Content Nylon.
  3. Tufted Yarn Weight: 15 oz/sy.
  4. Pile Thickness: 0.097 inches.
  5. Pile Density: 5,567 oz/yd.
  6. Stitches: 9 per inch.
  7. Radiant Panel: ASTM E-648 Class 1.
  8. Smoke Density: ASTM E-662  $\leq$  450.
  9. Preservative Protection: Intersept.
  10. Soil / Stain Protection: Manufacturer's standard with warranty.
  11. Color and Pattern: As indicated on Material Finish Legend.
  12. Installation Method: As indicated on Material Finish Legend.

## 2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by

carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less.
  2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Adhesive Tape: Tile Carpeting manufacturer's recommended adhesive tape to suit backing type and substrates involved.
- D. Resilient Transition Strips: Refer to Section 096513 "Resilient Base and Accessories" and Interior Material Finish Legend for information and products for use at carpet transitions.
- E. Topical Concrete Vapor Sealer: Liquid penetrating type or film-forming type, designed to seal concrete and inhibit moisture transmission through slab. Concrete vapor sealers shall be as recommended by tile carpeting Contractor based upon successful previous installations and as acceptable to tile carpeting manufacturer. Refer to Section 012200 "Unit Prices".

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Painted Subfloors: Perform bond test recommended in writing by adhesive manufacturer.
1. Underlayment surface is flat, smooth, evenly planed, tightly jointed, and free of irregularities, gaps greater than 1/8 inch, protrusions more than 1/32 inch, and substances that may interfere with adhesive bond or show through surface.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing

by carpet tile manufacturer.

- D. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by carpet tile manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by carpet tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
  - 4. Moisture Testing of Existing Slabs:
    - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours, unless a higher rate is accepted by flooring manufacturer in writing.
      - 1) Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than two tests in each installation area and with test areas evenly spaced in installation areas.
    - b. Perform relative humidity test using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 80 percent relative humidity level measurement, unless a higher rate is acceptable to flooring manufacturer.
- E. Concrete Vapor Sealer Application: When concrete vapor sealer is required, prepare surfaces to receive concrete vapor sealer and apply concrete vapor sealer in strict accordance with vapor sealer manufacturer's written instructions to suit slab moisture conditions encountered.
- F. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

### 3.3 INSTALLATION

- A. Installation: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method:
  - 1. At perimeter of each room/area: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.
  - 2. In field of room/area (inside glued down perimeter): install tiles with factory-applied releasable, pressure-sensitive adhesive strips.
  - 3. Tile Carpet C1, C2, C3, C4 & C5: Install with manufacturer's adhesive tape.
- C. Installation Layout: As indicated on Material Finish Legend.
- D. Maintain dye lot integrity. Do not mix dye lots in same area.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.



- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.
- H. Install pattern parallel to walls and borders.
- I. Resilient Transition Strips: Install at locations indicated and between carpet tile and adjacent finishes. Installation shall be in strict accordance with edging manufacturer's written recommendations.

#### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
  - 2. Remove yarns that protrude from carpet tile surface.
  - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813



## **SECTION 098433 - ACOUSTICAL WALL UNITS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes shop-fabricated, cementitious-fiber primed units and fabric-wrapped, sound-absorbing wall panel units tested for acoustical performance, including:
  - 1. Sound-Absorbing Wall Panels (098433.A01).
  - 2. Barrel Diffusing Wall Panels (098433.A12).
- B. Related Requirements:
  - 1. Section 098436 "Acoustical Ceiling Units" for shop-fabricated ceiling panels tested for acoustical performance.

#### **1.2 DEFINITIONS**

- A. NRC: Noise Reduction Coefficient.

#### **1.3 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of fabric facing, panel edge, core material, and mounting indicated.
- B. Shop Drawings: For each type of sound-absorbing wall units. Include mounting devices and details; details at panel head, base, joints between panels and corners; sections through each type of panel, and details at ceiling and wall intersections. Indicate panel edge, core and facing materials.
  - 1. Include elevations showing layout of panels and panel sizes; direction of fabric weave and pattern matching.
- C. Samples for Verification: For each type of panel, submit an actual panel, not less than 12 inches square by full thickness.
  - 1. Submit samples for each type of fabric facing for sound-absorbing wall units.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For sound-absorbing wall units to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.

#### **1.6 QUALITY ASSURANCE**

- A. Source Limitations: Obtain sound-absorbing wall units from single source from single manufacturer.
- B. Fire-Test-Response Characteristics: Provide sound-absorbing wall units meeting the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.
  - a. Flame-Spread Index: 25 or less.
  - b. Smoke-Developed Index: 450 or less.
2. Fire Growth Contribution: Meeting acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and sound-absorbing wall unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

#### 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install sound-absorbing wall units until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install sound-absorbing wall units until a permanent level of lighting is provided on surfaces to receive the units.
- C. Air-Quality Limitations: Protect sound-absorbing wall units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify locations of sound-absorbing wall units and actual dimensions of openings and penetrations by field measurements before fabrication.

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sound-absorbing wall units that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to the following:
    - a. Acoustical performance.
    - b. Fabric sagging, distorting, or releasing from panel edge.
    - c. Warping of core.
  2. Warranty Period: Two years from date of Substantial Completion.

### PART 2 PRODUCTS

#### 2.1 SOUND-ABSORBING WALL PANELS (098433.A01 – AP2, AP3).

- A. Basis of Design Products: Subject to compliance with requirements, provide "Acousti-Panels" by Golterman & Sabo Acoustics or a comparable product by one of the listed acceptable manufacturers with the following product characteristics:
  1. Acceptable Manufacturers:
    - a. Conwed Designscape, Owens Corning.

- b. Decoustics Limited, CertainTeed.
  - c. Kinetics Noise Control.
  - d. RPG Acoustical Systems.
  - e. Sound Seal.
  - f. Signature Craft.
  - g. Wall Technology, Owens Corning.
2. Description: Manufacturer's standard panel construction consisting of facing material stretched over front face of edge-framed core and bonded or attached to edges and back of frame.
  3. Mounting: Back mounted with manufacturer's standard magnetic devices or metal clips or bar hangers, secured to substrate.
  4. Core: glass-fiber board, 6 to 7 pcf density.
  5. Edge Construction: Manufacturer's standard chemically hardened core with no frame, or extruded-aluminum or zinc-coated, rolled-steel frame.
  6. Edge Profile: Square.
  7. Facing Material: As indicated in Material Finish Legend.
  8. Nominal Core Thickness: 2".
  9. Panel Width: As indicated on Drawings.
  10. Panel Height: As indicated on Drawings.
  11. Acoustic Performance:
  12. Acoustic Performance:
    - a. NRC of 1.05 per ASTM C423.

2.2 SOUND-ABSORBING WALL PANELS (098433.A01 – AP6, AP7).

A. Basis of Design Products: Subject to compliance with requirements, provide "Low Frequency Absorber (LFA-V2)" by Golterman & Sabo Acoustics or a comparable product by one of the listed acceptable manufacturers with the following product characteristics:

1. Acceptable Manufacturers:
  - a. Conwed Designscape, Owens Corning.
  - b. Decoustics Limited, CertainTeed.
  - c. Kinetics Noise Control.
  - d. RPG Acoustical Systems.
  - e. Sound Seal.
  - f. Signature Craft.
  - g. Wall Technology, Owens Corning.
2. Description: Manufacturer's standard panel construction consisting of facing material stretched over front face of edge-framed core, allowing for a low frequency trap and bonded or attached to edges and back of frame.
3. Mounting: Back mounted with manufacturer's standard magnetic devices or metal clips or bar hangers, secured to substrate.
4. Core: glass-fiber board, 6 to 7 pcf density.

5. Edge Construction: Manufacturer's standard chemically hardened core with no frame, or extruded-aluminum or zinc-coated, rolled-steel frame.
6. Edge Profile: Square.
7. Facing Material: As indicated in Material Finish Legend.
8. Nominal Core Thickness: 2".
  - a. Panel Width: As indicated on Drawings.
9. Panel Height: As indicated on Drawings.
10. Acoustic Performance:
  - a. NRC of 0.60 per ASTM C423.

### 2.3 BARREL DIFFUSING WALL PANELS - (098433.A12 - AP4, AP5)

A. Basis of Design Products: Subject to compliance with requirements, provide "Wall Sound Diffusers" by Golterman & Sabo Acoustics or a comparable product by one of the listed acceptable manufacturers with the following product characteristics:

1. Acceptable Manufacturers:
  - a. Conwed Designscape, Owens Corning.
  - b. Decoustics Limited, CertainTeed.
  - c. Kinetics Noise Control.
  - d. RPG Acoustical Systems.
  - e. Sound Seal.
  - f. Signature Craft.
  - g. Wall Technology, Owens Corning.
2. Description: Manufacturer's standard factory thermoformed co-polymer core construction with returns on back side of panel to promote installation.
3. Unit Configuration: Barrel.
4. Panel Shape: Rectangular and/or square as indicated.
5. Orientation of Sides: Horizontal.
6. Mounting: Back mounted with manufacturer's standard two-part cleat/clip system, secured to unit and to substrate.
7. Core: Manufacturer's stand as required to meet performance indicated.
8. Edge Construction: Manufacturer's standard square-edged with returns on back for wall mounting.
9. Edge Profile: Square.
10. Panel Finish: Factory finish, textured white.
  - a. Painted surface, as indicated in Material Finish Legend.
11. Panel Size: 24 inches x 24 inches
12. Acoustic Performance:
  - a. Standard core WD Panels: NRC of 0.20 per ASTM C423.

### 2.4 MATERIALS

A. Core Materials:

1. Glass-Fiber Board Backing: ASTM C 612, Type standard with manufacturer; nominal density of 6 to 7 lb/cu. ft., unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
  2. High Density Fiberglass Subfacing: 1/8-inch thick, 18 pcf fiberglass, unfaced, and dimensionally stable, impact resistant and tackable; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
  3. Cementitious-Fiber Board: Density of not less than 20 lb/cu. ft.
- B. Facing Materials: Fabric from same dye lot and as follows:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Carnegie; Xorel "Meteor", or comparable product from another manufacturer submitted to and accepted by Architect prior to bidding.
  2. Contents: 100 percent post-consumer recycled polyester.
  3. Flame Retardancy: Class A per ASTM E 84.
  4. Color and Pattern: As indicated on Material Finish Legend.
- C. Mounting Devices: Concealed on back of unit, as recommended by manufacturer to support weight of unit, and as follows:
1. Manufacturer's recommended adhesive.
  2. Metal Clips or Bar Hangers: Manufacturer's standard two-part metal "Z" clips, with one part of each clip mechanically attached to back of unit and the other part to substrate, designed to permit unit removal.
  3. Magnetic Strip or Devices: Manufacturer's standard.
  4. Corrosion Resistant Fasteners: For cementitious-fiber board panels, provide manufacturer's standard corrosion resistant fasteners.

## 2.5 FABRICATION

- A. General: Use manufacturer's standard construction except as otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
1. Glass-Fiber Board Cores: Chemically harden core edges and areas of core where mounting devices are attached.
- B. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
1. Square Corners: Tailor corners.
  2. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent units.

C. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:

1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine fabric, fabricated units, substrates, areas, and conditions, for compliance with requirements, installation tolerances, and other conditions affecting performance of sound-absorbing wall units.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install sound-absorbing wall units in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with sound-absorbing wall unit manufacturer's written instructions for installation of units using type of mounting specified. Mount units securely to supporting substrate.
- C. Align and level fabric pattern and grain among adjacent units.

### 3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus 1/16 inch.
- B. Variation of Panel Joints from Hairline: Not more than 1/16 inches wide.

### 3.4 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 098433



## **SECTION 098436 - ACOUSTICAL CEILING UNITS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes shop-fabricated, pre-finished panel units tested for acoustical performance, including:
  - 1. Sound-Diffusing Ceiling Panels (098436.A02).
- B. Related Requirements:
  - 1. Section 012300 "Alternates" for those alternates affecting work of this Section.
  - 2. Section 098433 "Sound-Absorbing Wall Units" for shop-fabricated fabric-wrapped wall panels tested for acoustical performance.

#### **1.2 DEFINITIONS**

- A. NRC: Noise reduction coefficient.
- B. SAA: Sound absorption average.

#### **1.3 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, mounting, material descriptions, dimensions of individual components and profiles, and finishes for sound-absorbing ceiling units.
  - 2. Include fabric facing, panel edge and ends, core material, and mounting indicated.
  - 3. Include furnished specialties and accessories.
- B. Shop Drawings: For unit assembly and installation.
  - 1. Include reflected ceiling plans, elevations, sections, and mounting devices and details.
  - 2. Include details at joints and corners; and details at ceiling intersections and intersections with walls. Indicate panel edge and end profiles and core materials.
  - 3. Include direction of fabric weave and pattern matching.
- C. Samples for Initial Selection: For each type of fabric facing.
  - 1. Include Samples of hardware and accessories involving color or finish selection.
- D. Samples for Verification: For the following products:
  - 1. Fabric: Full-width by approximately 24-inch- long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
  - 2. Panel Edge: 12-inch-long Sample(s) showing each edge profile, corner, and finish.

3. Core Material: 12-inch-square Sample at corner.
4. Mounting Devices: Full-size Samples.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  1. Suspended ceiling components above ceiling units.
  2. Structural members to which suspension devices will be attached.
  3. Items penetrating or covered by units including the following:
    - a. Lighting fixtures.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Alarms.
    - e. Sprinklers.
    - f. Access panels.
- B. Product certificates: For each type of sound-absorbing ceiling unit.
- C. Sample Warranty: For special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sound-absorbing and sound diffusing ceiling units to include in maintenance manuals.

#### 1.7 QUALITY ASSURANCE

- A. Integrated Field Sample: Build integrated field samples to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
  1. Build mockup of each type of typical baffle.
  2. Approval of field samples does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  3. Subject to compliance with requirements, approved field sample may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with sound-absorbing ceiling unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

#### 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

- B. Lighting: Do not install units until a permanent level of lighting is provided on surfaces to receive the units.
- C. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

#### 1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of sound-absorbing ceiling units that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Acoustical performance.
    - b. Fabric sagging, distorting, or releasing from panel edge.
    - c. Warping of core.
  - 2. Warranty Period: Two years from date of Substantial Completion.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Armstrong Ceiling Solutions.
  - 2. Conwed Designscape; an Owens Corning company.
  - 3. Decoustics Limited; a CertainTeed Ceilings company.
  - 4. Golterman & Sabo.
  - 5. Signature Craft.
  - 6. SoundSeal.
  - 7. Turf.
  - 8. Wall Technology, Inc.; an Owens Corning company.
  - 9. Wenger.
- B. Source Limitations: Obtain sound-absorbing ceiling units from single source from single manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide sound-absorbing ceiling units meeting the following requirements as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
  - 1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 450 or less.

2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.
- B. Ceiling materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

### 2.3 SOUND-DIFFUSING CEILING UNITS

- A. Sound-Diffusing Ceiling Panels (098436.A02 – AP1): Manufacturer's standard panel construction consisting of facing material laminated to front face, edges, and back edge border of core.
1. Basis of Design: Provide "Pyramidal Ceiling Diffuser Panels" by Wenger Corporation or product by a manufacturer listed above meeting the listed product characteristics.
  2. Panel Shape: Pyramidal.
  3. Mounting: Lay-in ceiling grid clip. All lay-in ceiling panels include safety cable attachment to permanent ceiling grid in all four corners of panel. Use mounting brackets and back-support/stiffening angles for ceiling installation.
  4. Core: Fire-retardant formed plastic, prepared for required acoustical performance.
  5. Edge Construction: Manufacturer's standard.
  6. Facing Material: Molded thermoplastic impact-resistant.
  7. Color: Refer to Material Finish Legend.
  8. Panel Size: 48 inches, square, nominal.
  9. Acoustic Performance
    - a. NRC of 0.30 per ASTM C423.

### 2.4 MATERIALS

- A. Core Materials:
1. Fire-Retardant Formed Fiberglass-Reinforced Plastic: Manufacturer's standard formed plastic with flame-spread index of 25 or less and smoke-developed index of 25 or less according to ASTM E 84.
  2. Polyester Core: Manufacturer standard formulation with a flame-spread index of 10 or less and a smoke-developed Index of 185 or less according to ASTM E 84.
- B. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of unit.
- C. Fasteners: Provide stainless steel fasteners designed for mechanical attachment to concrete substrates, similar to "410 Stainless Steel Series" by Tapcon.

### 2.5 FABRICATION

- A. General: Use manufacturer's standard construction except as otherwise indicated; with dimensionally stable core and with rigid edges to reinforce panel perimeter against warpage and damage.

B. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:

1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Examine fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting performance of sound-absorbing ceiling units.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install units in locations indicated. Unless otherwise indicated, install units with edges in alignment with walls and other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. For each type of diffuser and baffle, comply with unit manufacturer's written instructions and approved shop drawings, for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

#### 3.3 INSTALLATION TOLERANCES

- A. Variation from Alignment with Surfaces: Plus or minus 1/16 inch.
- B. Variation from Level or Slope: Plus or minus 1/16 inch.
- C. Variation of Panel Joints from Hairline: Not more than 1/16 inch wide.

#### 3.4 CLEANING

- A. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 098436



## **SECTION 099113 - EXTERIOR PAINTING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
  - 1. Steel and iron.
  - 2. Galvanized metal.
  - 3. Aluminum (not anodized or otherwise coated).
  - 4. Steel doors and frames.
  - 5. Miscellaneous mechanical, electrical, plumbing, fire suppression, communication and technology work as delineated in this section.
- B. Related Requirements:
  - 1. Section 012100 "Allowances" for those allowances affecting work of this Section.
  - 2. Section 012200 "Unit Prices" for unit prices affecting work of this Section.
  - 3. Section 012300 "Alternates" for those alternates related to work of this Section.
  - 4. Section 051200 "Structural Steel Framing" for shop priming of metal substrates.
  - 5. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
  - 6. Section 099123 "Interior painting" for surface preparation and the application of paint systems on interior substrates.
  - 7. Section 099600 "High-Performance Coatings" for special-use coatings.

#### **1.2 DEFINITIONS**

- A. Gloss Level 1 "Matte": Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3 "Eggshell": 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4 "Satin-like": 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5 "Semi-gloss": 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6 "Gloss": 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7 "High Gloss": More than 85 units at 60 degrees, according to ASTM D 523.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Indicate VOC content.

- B. Samples for Initial Selection: Where colors are not indicated on Drawings, submit for each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: One (1) gallon of each material and color applied.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

#### 1.6 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers - Basis of Design Products: Subject to compliance with requirements, provide products The Sherwin-Williams Company, or comparable products listed below:
  - 1. Glidden Professional.
  - 2. PPG Paints.
- B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior Painting Schedule for the paint category indicated.

#### 2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.



2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- B. Colors: Where not indicated on Drawings, as selected by Architect from manufacturer's full range.
1. Twenty percent of surface area will be painted with deep tones.
- C. Paint Systems: Refer to schedule at end of this Section.

## 2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
1. Owner may engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
  2. Testing agency will perform tests for compliance with product requirements.
  3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
  2. Masonry (Clay and CMUs): 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied

protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
1. SSPC-SP 3.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
  2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
  3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
  4. Paint entire exposed surface of window frames and sashes.
  5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Miscellaneous Painting of Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
  - 1. Paint the following work where exposed to view:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
      - 1) Also includes gas lines on roof.
    - c. Uninsulated plastic piping.
      - 1) Also includes PVC condensate lines on roof.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.
    - g. Tanks that do not have factory-applied final finishes.

### 3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
  - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
  - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.6 EXTERIOR PAINTING SCHEDULE

- A. Concrete:
  - 1. The Sherwin-Williams Company.

- a. 1 coat Loxon Concrete and Masonry Primer.
  - b. 2 coats Loxon Acrylic Masonry Coating, satin.
- B. CMU Substrates:
  - 1. The Sherwin-Williams Company.
    - a. 1 coat PrepRite Block Filler, B25W25.
    - b. 2 coats Pro Industrial Acrylic, B66-651 Series, semigloss.
- C. Steel Substrates - Unprimed:
  - 1. The Sherwin-Williams Company.
    - a. 1 coat Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
    - b. 2 coats Pro Industrial WB Alkyd Urethane.
- D. Steel Substrates – Primed:
  - 1. **[[ GENERIC, NOT SUBJECT TO ABUSE ]]**
  - 2. Benjamin Moore & Co.
    - a. 1 coat Ultra Spec Acrylic Metal Primer HP04.
      - 1) **[[ LEED V4, CHPS Low Emitting Credit ]]**
    - b. 2 coats Ultra Spec DTM Acrylic Low Lustre Enamel HP25.
      - 1) **[[ LEED V4, CHPS Low Emitting Credit ]]**
  - 3. Glidden Professional.
    - a. 2 coats Fortis Exterior Acrylic, satin.
      - 1) Timeless Exterior Acrylic, satin.
        - (a) **[[ LEED V4 ]]**
  - 4. PPG Paints.
    - a. 2 coats 6-2045XI Speedhide Exterior, satin.
      - 1) Speedhide Exterior Acrylic Latex, satin.
        - (a) **[[ LEED V4 ]]**
  - 5. The Sherwin-Williams Company.
    - a. 2 coats A-100 Latex, satin.
- E. Steel Substrates - Primed:
  - 1. The Sherwin-Williams Company.
    - a. 1 touchup coat Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
    - b. 2 coats Pro Industrial WB Alkyd Urethane.
- F. Steel Substrates – Galvanized (except handrails and guardrails):
  - 1. The Sherwin-Williams Company.
    - a. 2 coats A-100 Latex, satin.
- G. Galvanized Steel Substrates – (except railings, handrails and guardrails):
  - 1. The Sherwin-Williams Company.
    - a. 1 touchup coat Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
    - b. 2 coats Pro Industrial WB Alkyd Urethane.
- H. Primed Steel Doors and Frames:
  - 1. The Sherwin-Williams Company.
    - a. 1 coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
    - b. 2 coats Pro Industrial WB Alkyd Urethane.
- I. Steel Substrates – Galvanized Steel Handrails and Guardrails (where railings are indicated to be painted):
  - 1. The Sherwin-Williams Company.

- a. 1 coat Macropoxy 646.
  - b. 2 coats Acrylon 218 HS acrylic polyurethane, gloss.
- J. Aluminum Substrates – Gloss:

1. The Sherwin-Williams Company.

- a. 1 touchup coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
- b. 2 coats Pro Industrial WB Alkyd Urethane.

END OF SECTION 099113



## **SECTION 099123 - INTERIOR PAINTING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
  - 1. Concrete.
  - 2. Concrete masonry units (CMUs).
  - 3. Steel and iron.
  - 4. Galvanized metal.
  - 5. Aluminum (not anodized or otherwise coated).
  - 6. Wood.
  - 7. Gypsum board.
  - 8. Plaster.
- B. Related Requirements:
  - 1. Section 012100 "Allowances" for those allowances affecting work of this Section.
  - 2. Section 012200 "Unit Prices" for unit prices affecting work of this Section.
  - 3. Section 012300 "Alternates" for those alternates related to work of this Section.
  - 4. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
  - 5. Section 099600 "High-Performance Coatings" for special-use coatings.

#### **1.2 DEFINITIONS**

- A. Gloss Level 1 "Matte": Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2 "Flat": Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3 "Eggshell": 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4 "Satin-like": 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5 "Semi-gloss": 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6 "Gloss": 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7 "High Gloss": More than 85 units at 60 degrees, according to ASTM D 523.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Indicate VOC content.
- B. Samples for Initial Selection: Where colors are not specifically indicated, submit for each type of topcoat product.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
  1. Submit Samples on rigid backing, 8 inches square.
  2. Label each coat of each Sample.
- D. Product List: For each product indicated, include the following:
  1. Cross-reference to paint system and locations of application areas.
  2. Use same designations indicated on Drawings and in schedules.
  3. Include color designations.
  4. VOC content.

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Paint: 1 gallon of each material and color applied.

#### 1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
    - b. Other Items: Architect will designate items or areas required.
  2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
  3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  1. Maintain containers in clean condition, free of foreign materials and residue.
  2. Remove rags and waste from storage areas daily.



## 1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products from one of the following, unless specified otherwise.
  - 1. The Sherwin-Williams Company.
- B. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting Schedule for the paint category indicated.

### 2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- B. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Colors: Where not indicated on Drawings, as selected by Architect from manufacturer's full range.
- D. Keynote Designations:
  - 1. Dryfall: (099123.A07).
- E. Material Finish Schedule designations: "P1" through "P4".
  - 1. Provide "flat" sheen for ceilings, unless otherwise specified.
  - 2. Provide "eggshell" sheen for walls, unless otherwise specified.
  - 3. Provide dryfall paint as specified in this section.
- F. Paint Systems: Refer to schedule at end of this Section.

## 2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
1. Owner may engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
  2. Testing agency will perform tests for compliance with product requirements.
  3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
  2. Masonry (Clay and CMUs): 12 percent.
  3. Wood: 15 percent.
  4. Gypsum Board: 12 percent.
  5. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied

protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
1. SSPC-SP 3.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  2. Sand surfaces that will be exposed to view, and dust off.
  3. Prime edges, ends, faces, undersides, and backsides of wood.
  4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- K. Existing Substrates: Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Prepare substrates in accordance with paint manufacturer's recommendations to ensure adhesion.

### 3.3 APPLICATION

- A. Apply paints according to paint manufacturer's written instructions and to recommendations.
1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
  6. Paint exposed air diffusers and grilles same color as adjacent wall or ceiling finish as directed by Architect.
  7. Mask off surfaces of doors prior to painting vision lite frames. Clean any excess paint from door surface to so that there is no evidence of excess paint remaining on door face and glass.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following work where exposed in occupied spaces:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.
    - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    - h. Other items as directed by Architect.
  2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.
- F. Marking and Identification: Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other walls required to have protected openings and penetrations shall be permanently identified with stenciling. Such identification shall:
1. Be located in accessible concealed floor, floor/ceiling or attic spaces;

2. Be located within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along the wall or partition; and
3. Shall include lettering not less than 3 inches in height with a minimum 3/8-inch wide stroke in a contrasting color incorporating the following wording on the first line: "FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS".

### 3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
  1. Contractor shall touch up and restore painted surfaces damaged by testing.
  2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Wall Surfaces – Latex System:
  1. The Sherwin-Williams Company.
    - a. 1 coat ProMar 200 Zero VOC Interior Latex Primer.
    - b. 2 coats ProMar 200 Zero VOC Latex, eggshell.
- B. Portland Cement Plaster Substrates (Existing), Wall Surfaces - Latex System:
  1. The Sherwin-Williams Company.
    - a. 1 touchup coat ProMar 200 Zero VOC Interior Latex Primer (spot prime bare areas).
    - b. 2 coats ProMar 200 Zero VOC Latex, eggshell.
- C. Portland Cement Plaster Substrates (Existing), Ceiling Surfaces - Latex System:
  1. The Sherwin-Williams Company.
    - a. 1 touchup coat ProMar 200 Zero VOC Interior Latex Primer (spot prime bare areas).
    - b. 2 coats Pro Industrial Waterborne Acrylic Dryfall, eggshell.
- D. CMU Substrates – Epoxy System: Refer to Section 099600.
- E. Steel Substrates – Non-primed:

1. The Sherwin-Williams Company.
    - a. 1 coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
    - b. 2 coats Pro Industrial WB Alkyd Urethane.
  - F. Steel Substrates – Pre-primed:
    1. The Sherwin-Williams Company.
      - a. 1 coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
      - b. 2 coats Pro Industrial WB Alkyd Urethane.
  - G. Steel Hollow Metal Doors and Frames (including doors, frames, metal glass stops, vision lite frames, astragals and metal louvers): Epoxy Paint - Refer to Section 099600
  - H. Steel Substrates (exposed metal decking, bar joists and exposed over-head structure) – Dryfall.
    1. The Sherwin-Williams Company.
      - a. 2 coats Pro Industrial Waterborne Acrylic Dryfall, eggshell
  - I. Galvanized-Metal Substrates (where not specifically indicated to be painted):
    1. The Sherwin-Williams Company.
      - a. 1 coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer..
      - b. 2 coats Pro Industrial Acrylic, semi-gloss.
  - J. Galvanized-Metal Ductwork Substrates:
    1. The Sherwin-Williams Company.
      - a. 1 coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
      - b. 2 coats Pro Industrial Waterborne Acrylic Dryfall, eggshell.
  - K. Aluminum (Not Anodized or Otherwise Coated) Substrates:
    1. The Sherwin-Williams Company.
      - a. 1 coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
      - b. 2 coats Pro Industrial WB Alkyd Urethane
  - L. Gypsum Board Wall Substrates – Latex:
    1. The Sherwin-Williams Company.
      - a. 1 coat ProMar 200 Zero VOC Interior Latex Primer.
      - b. 2 coats ProMar 200 Zero VOC Latex, eggshell.
  - M. Gypsum Board Ceiling Substrates – Latex:
    1. The Sherwin-Williams Company.
      - a. 1 coat ProMar 200 Zero VOC Interior Latex Primer.
      - b. 2 coats ProMar 200 Zero VOC Latex, flat.
  - N. Gypsum Board Wall Substrates – Epoxy: Refer to Section 099600.
  - O. Gypsum Board Wall and Ceiling Substrates indicated to receive Vinyl Wall Graphics – prepare per the wallcovering manufacturer’s printed recommendations.
    1. The Sherwin-Williams Company.
      - a. 1 coat SuperPaint Interior Latex.
- END OF SECTION 099123

## **SECTION 099600 - HIGH PERFORMANCE COATINGS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes surface preparation and the application of high-performance coating systems on the following substrates:
  - 1. Exterior Substrates:
    - a. Steel.
    - b. Galvanized metal.
  - 2. Interior Substrates:
    - a. Concrete, vertical and horizontal surfaces.
    - b. Concrete masonry units (CMUs).
    - c. Steel.
    - d. Galvanized metal.
    - e. Aluminum (not anodized or otherwise coated).
    - f. Gypsum board.
- B. Related Requirements:
  - 1. Section 012100 "Allowances" for those allowances affecting work of this Section.
  - 2. Section 012200 "Unit Prices" for unit prices affecting work of this Section.
  - 3. Section 012300 "Alternates" for those alternates related to work of this Section.
  - 4. Section 055213 "Pipe and Tube Railings" for shop priming pipe and tube railings with coatings specified in this Section.
  - 5. Section 099113 "Exterior Painting" for general field painting.
  - 6. Section 099123 "Interior Painting" for general field painting.

#### **1.2 DEFINITIONS**

- A. Gloss Level 3 "Eggshell": 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 5 "Semi-gloss": 35 to 70 units at 60 degrees, according to ASTM D 523.
- C. Gloss Level 6 "Gloss": 70 to 85 units at 60 degrees, according to ASTM D 523.
- D. Gloss Level 7 "High Gloss": More than 85 units at 60 degrees, according to ASTM D 523.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Apply coats on Samples in steps to show each coat required for system.

3. Label each coat of each Sample.
  4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
1. Cross-reference to coating system and locations of application areas.
  2. Use same designations indicated on Drawings and in schedules.
  3. Color designations.

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Coatings: One (1) gallon of each material and color applied.

#### 1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each coating system.
    - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
    - b. Pipe and Tube Railings: Paint at one section of railing.
    - c. Other Items: Architect will designate items or areas required.
  2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
  3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
  2. Remove rags and waste from storage areas daily.

#### 1.7 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.



- C. Do not apply exterior coatings in snow, rain, fog, or mist.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products from the following, unless specified otherwise.
  - 1. The Sherwin-Williams Company.
  - 2. Tnemec Company, Inc.
- B. Products: Subject to compliance with requirements, provide products listed in the Exterior High-Performance Coating Schedule and Interior High-Performance Coating Schedule for the coating category indicated.

### 2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. Material Compatibility:
  - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
  - 3. Products shall be of same manufacturer for each coat in a coating system.
- B. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Colors: Where not indicated on Drawings, as selected by Architect from manufacturer's full range.
- D. Paint Systems: Refer to schedule at end of this Section.
- E. Material Finish Legend designations:
  - 1. Wall & Ceiling Finishes: 099600.A01, finishes "P1" through "P6."

### 2.3 SOURCE QUALITY CONTROL

- A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
  - 1. Owner may engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
  - 2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  1. Concrete: 12 percent.
  2. Masonry (Clay and CMUs): 12 percent.
  3. Wood: 15 percent.
  4. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
  1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.
  1. Prepare previously painted surfaces indicated to receive new paint finish in strict accordance with paint manufacturer's written recommendations.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
  - 1. Clean concrete by one of the following methods as recommended by paint manufacturer:
    - a. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi at 6 to 12 inches.
    - b. Abrasive blast clean surfaces to comply with SSPC-SP 7/NACE No. 4.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.
  - 1. Clean surfaces with pressurized water. Use pressure range of 100 to 600 psi at 6 to 12 inches.
- F. Existing Pre-Painted CMU Substrates: Clean and prepare as recommended by coating manufacturer.
- G. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.
- H. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- I. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.
- J. Aluminum Substrates: Remove loose surface oxidation.
- K. Wood Substrates:
  - 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer that is recommended in writing by topcoat manufacturer for coating system indicated.
  - 2. Sand surfaces that will be exposed to view and dust off.
  - 3. Prime edges, ends, faces, undersides, and backsides of wood.
  - 4. After priming, fill holes and imperfections in the finish surfaces with filler that is recommended in writing by topcoat manufacturer for coating system indicated. Sand smooth when dried.
- L. Existing Ceramic Tile Substrates: Clean and prepare as recommended by coating manufacturer.

### 3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions.
  - 1. Use applicators and techniques suited for coating and substrate indicated.
  - 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

### 3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
  1. Contractor shall touch up and restore coated surfaces damaged by testing.
  2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

### 3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Structural and Miscellaneous Steel:
  1. The Sherwin-Williams Company.
    - a. 1 coat Macropoxy 646.
    - b. 1 coat Acrolon 218 HS Polyester Acrylic Polyurethane, semi-gloss.
- B. Steel Substrates:
  1. The Sherwin-Williams Company.
    - a. 1 coat Macropoxy 646.
    - b. 1 coat FluoroKem HS.
- C. Exposed Galvanized Structural Steel Surfaces:

1. The Sherwin-Williams Company.
  - a. 1 touch-up coat Zinc Clad IV, organic zinc rich epoxy primer.
  - b. 2 coats Sher-Cryl (HPA) high performance acrylic, semi-gloss.
- D. Fluid Applied Insulation Coating for Steel - Exposed and Non-Exposed (099600.A05):
  1. 1 coat Tnemec Series 394-0250 PerimePrime, mio-zinc filled aromatic polyurethane.
  2. 1 coat Tnemec Series 971 Aerolon Acrylic, field applied acrylic insulation coating.
  3. 1 coat Tnemec Series 1028 Enduratone, waterbased high dispersion pure acrylic polymer.
    - a. For areas not exposed to public view, this finished topcoat of paint may be omitted.
  4. System shall be applied as recommended by manufacturer for a thermal-break application.
  5. Minimum application to structural members shall be 24 inches from the exterior face of exterior walls, through entire thickness of wall, and to a point at a minimum of 24 inches beyond interior face of exterior wall.
  6. Fluid applied Insulation Coatings for existing Structural Steel shall be installed as indicated on the drawings.

### 3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Exposed Structural Steel Columns and Framing:
  1. The Sherwin-Williams Company.
    - a. 1 coat Macropoxy 646.
    - b. 1 coat Acrolon 218 HS Polyester Acrylic Polyurethane, semi-gloss.
- B. Steel Hollow Metal Doors and Frames:
  1. The Sherwin-Williams Company.
    - a. 1 coat Macropoxy 646.
    - b. 1 coat Acrolon 218 HS Polyester Acrylic Polyurethane, semi-gloss.
- C. Concrete and CMU Substrates - Epoxy System (non-wet walls):
  1. The Sherwin-Williams Company.
    - a. 1 coat Loxon Block Surfacer, 18 mils wet, 8 mils dry
    - b. 2 coats Pro Industrial Pre-Catalyzed Waterbased Epoxy, 1150 Series, single-component, eggshell
- D. Concrete and CMU Substrates - Epoxy System (wet areas):
  1. The Sherwin-Williams Company.
    - a. 1 coat KemCati Kote High Solids Epoxy Filler/Sealer.
    - b. 2 coats Pro Industrial Zero VOC Waterborne Catalyzed Epoxy, two-component, eggshell
- E. Gypsum Board Wall Substrates – Epoxy:
  1. The Sherwin-Williams Company.
    - a. 1 coat ProMar 200 Zero VOC Interior Primer.
    - b. 2 coats Pro Industrial Pre-Catalyzed Waterbased Epoxy, 1150 Series, single-component, eggshell
- F. Gypsum Board Wall Substrates – Epoxy (wet areas):
  1. The Sherwin-Williams Company.
    - a. 1 coat ProMar 200 Zero VOC Interior Primer.
    - b. 2 coats Pro Industrial Zero VOC Waterborne Catalyzed Epoxy, two-component, eggshell.
- G. Gypsum Board Ceiling Substrates – Epoxy (wet areas):

1. The Sherwin-Williams Company.

a. 1 coat Sherwin Williams Macropoxy 646-100.

b. 2 coats Pro Industrial Zero VOC Waterborne Catalyzed Epoxy, two-component, eggshell

END OF SECTION 099600

## **SECTION 101100 - VISUAL DISPLAY UNITS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Markerboards (101100.A02).

**B. Related Requirements:**

1. Section 012300 "Alternates" for those alternates affecting work of this Section.

#### **1.2 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference:** Conduct conference at Project site.

#### **1.3 ACTION SUBMITTALS**

**A. Product Data:** For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
2. Include electrical characteristics for motorized units.

**B. Shop Drawings:** For visual display units.

1. Include plans, elevations, sections, details, and attachment to other work.
2. Show locations of panel joints. Show locations of field-assembled joints for factory-fabricated units too large to ship in one piece.
3. Show locations and layout of special-purpose graphics.
4. Include sections of typical trim members.

**C. Samples for Verification:** For each type of visual display unit indicated.

1. Visual Display Panel: Not less than 8-1/2 by 11 inches, with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.
2. Trim: 6-inch-long sections of each trim profile.
3. Accessories: Full-size Sample of each type of accessory.

#### **1.4 INFORMATIONAL SUBMITTALS**

**A. Qualification Data:** For qualified Installer.

**B. Sample Warranties:** For special warranties.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data:** For visual display units] to include in maintenance manuals.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.
- B. Deliver factory-built visual display surfaces, including factory-applied trim, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.
  - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

## 1.9 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Surfaces lose original writing and erasing qualities.
    - b. Surfaces exhibit crazing, cracking, or flaking.
  - 2. Warranty Period: Life of the building.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.



2. Smoke-Developed Index: 450 or less.

### 2.3 MARKERBOARD ASSEMBLIES

- A. Porcelain-Enamel Markerboards (101100.A02 – Type MB1): Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and porcelain-enamel face sheet.
  1. Basis of Design: Subject to compliance with requirements, provide products by Claridge Products provide Claridge, Inc.; "Series 5" markerboards or one markerboards of the following manufacturers meeting the specified product characteristics:
    - a. Marsh Industries, Inc.; Visual Products Group.
    - b. PolyVision Corporation; a Steelcase company.
  2. Particleboard Core: 3/8 inch to 1/2 inch thick; with 0.005 inch thick, aluminum foil backing.
  3. Laminating Adhesive: Manufacturer's standard, moisture-resistant thermoplastic type.
  4. Writing Surface: Low Gloss Porcelain Enamel Steel surface recommended by manufacturer for projections.
    - a. Basis of Design: "LCS3" by Claridge Products.
      - 1) Color: White #100.
    - b. Maintenance: Manufacturer's cleaning recommendations shall allow the use of non-proprietary cleaners and shall include instructions for removal of permanent markers.
  5. Frames: Fabricated from not less than 0.062 inch thick, extruded aluminum; 5/8-inch inch flat style trim with mitered corners; factory applied.
    - a. Color: Satin Anodized Aluminum.
  6. Markertray: Manufacturer's standard, continuous:
    - a. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.
  7. Map Rail: Provide the following accessories:
    - a. Display Rail: Continuous and integral with map rail; fabricated from cork approximately 1 to 1-1/2 inches wide.
    - b. End Stops: Located at each end of map rail.

### 2.4 MATERIALS

- A. Extruded Aluminum: ASTM B 221, Alloy 6063.
- B. Fiberboard: ASTM C 208 cellulosic fiber insulating board.
- C. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
- D. Particleboard: ANSI A208.1, Grade M-1.
- E. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

### 2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine walls and partitions for proper preparation and backing for visual display units.
- C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.

### 3.3 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY BOARDS AND ASSEMBLIES

- A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches o.c. Secure both top and bottom of boards to walls. Do NOT adhesively apply visual display boards to wall substrates.

### 3.4 CLEANING AND PROTECTION

- A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100

## SECTION 101400 - SIGNAGE

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Signage:
    - a. Flat Cut:
      - 1) Custom (101400.A31 - S07).
    - b. Film:
      - 1) Interior vinyl graphics - smooth substrate (101400.A40 - S06, S07, S08).
      - 2) Interior vinyl graphics - textured substrate (101400.A41 - S01, S02, S03, S04, S05).
    - c. Paint:
      - 1) Painted Graphic – Epoxy Paint (101400.A61 - S06).
- B. Related Sections include the following:
  - 1. Section 015000 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
  - 2. Section 099123 "Interior Painting" for painting behind vinyl film signage.
  - 3. Section 099600 "High Performance Coatings" for painting of graphics on precast walls.
  - 4. Section 101423 "ADA and Code Signage" for related graphic substrate.

#### 1.2 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."
- B. Final Artwork: High resolution digital files to be used for production (including digital printing).
  - 1. Graphics shown in drawings are placeholders only.
  - 2. Final artwork will be provided by the Architect after field dimensions of installed locations have been supplied via shop drawings from signage contractor. Final Artwork shop drawings will be approved by Owner and the Designer.
- C. Signage Contractor: Contractor responsible for the fabrication and installation of signage unless responsibility for fabrication or installation is called out by others in the drawings.

#### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation Conference: Conduct conference at Project site.
  - 1. Review and finalize construction schedule including submittals, engineering, fabrication and installation. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review temporary protection requirements for during and after installation.
  - 3. Architect to work with Contractor to arrange the meeting. Architect to set agenda and run the meeting.
- B. Signage Contractor is responsible for obtaining all required signage permits.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Including but not limited to, the following:
  - 1. Manufacturer's technical product data for each type of product specified. Include data on physical characteristics, durability, fade resistance, flame resistance and manufacturing process.
  - 2. Product data shall show compliance with requirements for fire performance characteristics and physical properties.

- B. Shop Drawings: Submit shop drawings for fabrication and erection of signs and supports. Include plans, elevations, and large scale details of sign wording and lettering layout. Include large scale sections of typical members and other components.
1. Show fabrication joints and fasteners. Show anchors, grounds, reinforcement, accessories, layout, and installation details including attachments to other work. Indicate materials and profiles of signage fittings, joinery, finishes, fasteners, anchorages, and accessory items.
  2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
  3. Based on Message Schedule approved by Owner, provide sign layouts for all signs:
    - a. Indicate message line breaks.
    - b. Include large scale details of signs wording and lettering layout, pictograms (arrows and symbols), artwork, and Braille layout.
    - c. Include outline of sign face, character spacing, line spacing, and copy composition.
    - d. Submit product data simultaneously for overall review and comparison prior to fabrication.
  4. Include a panel map for each vinyl film sign to coordinate installation.
  5. Field Dimensions shall be obtained, reviewed, and accepted by signage manufacturer prior to submittal of shop drawings. Refer to Article 1.4.G. "Field Dimensions for Environmental Graphics."
  6. For signage required to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  7. Wiring Diagrams: For illuminated signs and illuminated characters. Include locations of transformers and disconnect switches.
  8. For signs supported by or anchored to permanent construction, provide setting drawings, full-size spacing templates, and directions for installation of anchor bolts and other appropriate anchors to be installed.
  9. Submit drawings in 11 inch by 17 inch format unless otherwise requested by the Architect.
  10. Submit all shop drawings as a single package by Signage Contractor.
- C. Sign Schedule: Use same designations indicated on Drawings.
- D. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available.
- E. Samples for Verification:
1. Custom Digital Graphic Proofs, including vinyl film and direct printing: Before printing final work, prepare full-color proofs which include a 24 inch x 24 inch full-scale sample at full resolution, as well as a reduced sample of the entire graphic for each mural for the Architect's approval. Approved proof will set the quality standards for graphic and aesthetic effect.
    - a. Sample must be printed on specified material.
    - b. Include any overlaminates or coatings that will be used in final application.
    - c. Samples for clear film must be applied to a 1/4" sheet of acrylic for review.
    - d. When wall graphic is divided into separate sections, provide proof of each section.
    - e. Submit results of adhesion test for graphic film to Architect and Owner prior to installation.
    - f. Sample from same flitch to be used for the work, with specified finish applied.
  2. Submit 12-inch-long actual samples of each accessory required.
  3. Samples to be kept by the Architect as a record to later match against items in the field.
- F. Delegated-Design Submittal: For all signage unless otherwise noted.
1. Drawings are for aesthetic and functional design intent, only. No instructions for structural appropriateness have been made. It is the responsibility of the signage contractor to ensure that all elements are fabricated for a stable and durable installation while adhering to the aesthetic details indicated.
- G. Mockups/Field Samples: Build mockups/field samples to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Approved Mock-ups to be kept by Architect as a reference to set the minimum standard of quality for work on site.
1. Build mockups/field samples for environmental graphics and signage and additional signage as requested.
  2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  3. Subject to compliance with requirements, approved mockups/field sample areas may become part of the completed work if undisturbed at the time of Substantial Completion.
    - a. Contractor shall be held responsible for unsuccessful installations of vinyl graphic film that damage substrate during construction.
    - b. Direct Print Graphic to be installed in location deemed acceptable by the Architect/Owner prior to full install.

H. Field Dimensions for Graphic Design:

1. Provide field dimensions to Architect for graphic design of graphics.
  - a. Field dimensions shall be accepted by Architect prior to final art release.
2. Include dimensions, locations, and graphic depictions of all disruptions within the field of wall surface indicated to receive graphic signage. Examples of disruptions of wall surface include, but are not limited to, the following:
  - a. Louvers, Vents, Ductwork, Thermostats.
  - b. Outlets, Light Switches, Light Fixtures, and Conduit.
  - c. Wall Base, Baseboards, Corner Guards, Expansion Joints, and Reveal Joints.
  - d. Motion Sensors.
  - e. Fire Alarm Devices.
  - f. Fire Extinguishers and Fire Extinguisher Cabinets.
  - g. Furnitures.
  - h. ADA signage, Room Signage, and other Code required signage.
  - i. Doors and Windows.
  - j. Mullions, Frames, and Handles.
  - k. Televisions.
  - l. Other obstructions to wall or glazing surfaces not listed that would adversely affect wall graphic design.
3. Elevations and dimensions shall be drawing using a computer aided drafting program and submitted in a legible format.
4. Dimensional Tolerance: 1/8-inch maximum.
5. Dimensions shall be reviewed and accepted by signage manufacturer prior to submittal of shop drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Warranty: Special warranty specified in this Section.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals. Include the following:
  1. Methods for maintaining wall covering.
  2. Include precautions for use of cleaning materials and methods that could be detrimental to finishes and performance/longevity of film graphics.
- B. Warranty: Provide warranty documentation for signage.

1.7 QUALITY ASSURANCE

- A. Signage Contractor Qualifications: All sign fabrication within this section shall be performed by a signage contractor with the following:
  1. A minimum of five (5) years experience producing architectural signs, and a minimum of five (5) years experience producing compliant signs as specified in ANSI 117.1 (1986), Minimum Guidelines and Requirements for Accessible Design (MGRAD), Uniform Federal Accessibility Standards (UFAS) and American with Disabilities Act Accessibility Guidelines (ADAAG).
  2. A firm that employs skilled workers experienced in producing custom-fabricated products similar to those required for this Project and with at least seven years continuous experience under the current company name. Fabricator shall have a record of successful in-service performance, as well as sufficient production capacity to produce required units.
  3. Fabricator shall have completed at least seven (7) similar signage projects having similar requirements within the last four (4) years for each signage type.
  4. 3M-certified printer and 3M-certified installer. Subcontracting to a 3M-certified printer is acceptable.
- B. Uniformity of Manufacturer: For each separate type of sign and graphic image required, obtain signs from a single manufacturer.
  1. Manufacturer's name, trade name, or trademark shall not appear on any visible surface.

- C. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines. Comply with applicable provisions in ICC/ANSI A117.1.
- D. Fire Performance Characteristics: Provide wall coverings with the following surface burning characteristics as determined by testing identical products per ASTM E 84 by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify wall coverings with appropriate markings of applicable testing and inspecting organization.
  - 1. Flame Spread: 5 or less.
  - 2. Smoke Developed: 25 or less.
- E. Aesthetic Requirements: Provide copy with straight and true edges; space characters as indicated; reproduce type style accurately with square corners and even curves; provide uniform letters and symbols; and provide smooth finishes with no visible imperfections.
- F. ADA Accessibility Guidelines: Signage shall comply with the ADA Accessibility Guidelines where applicable. Characters and graphics, including but-not limited to, copy height, letter stroke symbols, materials, and finishes indicated on the Drawings are intended as guidelines for compliance. Implement each applicable ADA guideline. Should conflicts arise, notify the Designer before proceeding.
- G. Inspections: The Architect reserves the right to periodically visit the Signage Contractor's facilities to inspect and review layouts.

#### 1.8 DELIVERY, STORAGE AND HANDLING

- A. Use special care in handling to prevent twisting, warping, nicking, and other damage to signage. Store materials to permit easy access for inspection and identification.
  - 1. Keep aluminum off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect aluminum and packaged materials from corrosion and deterioration.
- B. Coordinate delivery and storage of sign materials with the Owner. Schedule delivery to minimize storage requirements.
- C. Store signage in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity. Materials stored at the Project Site without prior approval of the Owner, may have to be relocated at the sign Signage Contractor's expense.

#### 1.9 PROJECT CONDITIONS

- A. Weather Limitations for Exterior Signage: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.
- B. Interior Environmental Limitations: Do not deliver and install glass graphics until spaces are enclosed and weathertight, wet work in spaces to receive murals is complete and dry, work above ceilings is complete, and temporary or permanent HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
  - 1. Maintain a constant temperature not less than 60 deg F in installation areas for at least 10 days before and 10 days after installation.
- C. Lighting: Do not install vinyl wall graphics until permanent level of lighting is provided on the surfaces to receive murals.
- D. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by the vinyl wall graphics manufacturer for full drying and curing.
- E. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

## 1.10 COORDINATION

- A. Signage Contractor is responsible for preparing a schedule indicating engineering, fabrication, delivery, installation, and final inspection of the work. Submit this schedule to the Architect and Owner for approval and coordination with other work at the Project Site.
- B. Installation:
  - 1. Coordinate installation with the Owner, Construction Manager, and other trades.
  - 2. For signs supported by or anchored to permanent construction, coordinate specific requirements for types and placement of anchorage devices and similar items to be used for attaching signs. Deliver such items to Project Site in time for installation.
  - 3. Signage Contractor is responsible for furnishing setting drawings, installation templates and directions for installing for appropriate blocking, anchorage devices, and electrical conduits.
  - 4. Signage Contractor to coordinate all appropriate blocking needed.
- C. Coordinate location of remote transformers with building construction. Ensure that any transformers are accessible after completion of work.

## 1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Deterioration of metal and polymer finishes beyond normal weathering.
    - b. Deterioration of embedded graphic image colors.
  - 2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. General: Use materials of size and thickness indicated or, if not indicated as required to produce strength and durability in finished product for use intended. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.
- B. All materials shall be new stock, free from defects impairing strength, durability, and appearance. No fabrication or installation materials or procedures shall be used that will in any way change the usual quality or in any manner have an adverse effect on existing materials and surfaces.
- C. Graphic Content and Style: Provide sign copy that complies with requirements indicated in the Message Schedule on Drawings, and on artwork for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage. All digital prints to be high resolution output.
- D. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVA (UV absorbing).
  - 1. Acrylic for LED's Basis-of-Design Product: Subject to compliance with requirements, provide "Acrylite LED Sign Grade" or a comparable product of an approved manufacturer. Submit in accordance with substitution requirements found in Section 012500 "Substitution Procedures".
- E. Expanded PVC Sheet: Subject to compliance with requirements, provide "Sintra" by 3A Composites.
  - 1. Material: Moderately expanded closed-cell polyvinyl chloride.
  - 2. Color: As selected by Architect from manufacturer's full range.
  - 3. Basis-of-Design Product: Subject to compliance with requirements, provide "Sintra" by 3A Composites or a comparable product of an approved manufacturer.
- F. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.
  - 1. Basis of design: Matthews Paint System.

- G. PETG (Polyethylene Terephthalate Glycol) Sheet: ASTM D 5047-17 category as standard with manufacturer for each sign.
  - 1. Tensile Strength: 7,700 lbf/sq. in. per ASTM D 638.
  - 2. Flexural Modulus of Elasticity: 310,000 lbf/sq. in. per ASTM D 790.
- H. Photopolymer Sheet: Manufacturer's recommended photopolymer for producing integral non-laminated raised copy.
- I. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, ASTM C 1349, Appendix X1, Type II (coated, mar-resistant, UV-stabilized polycarbonate), coated on both surfaces with abrasion-resistant coating:
  - 1. Impact Resistance: 16 ft-lbf/in. per ASTM D 256, Method A.
  - 2. Tensile Strength: 9000 lbf/sq. in. per ASTM D 638.
  - 3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. per ASTM D 790.
  - 4. Heat Deflection: 265 deg F at 264 lbf/sq. in. per ASTM D 648.
  - 5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.
    - a. Basis-of-Design Product: Subject to compliance with requirements, provide "Lexan" by A&C Plastics or a comparable product of an approved manufacturer.
- J. Vinyl Film: UV-Resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.

## 2.2 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Acrylic Sheet Finishes
  - 1. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.
- E. Industrial Paint Finish:
  - 1. Basis of Design: Provide MAP Ultra Low VOC by Matthews Paint Company or a comparable product submitted to and accepted by Architect with the following product characteristics.
  - 2. Finished coated surface shall provide a minimum of 150 in/lbs of impact resistance on all exposed faces.
  - 3. All edges and faces shall have a seamless finish unless indicated otherwise on drawings.

## 2.3 ACCESSORIES

- A. Mounting Methods: Use double sided vinyl tape and silicone adhesive fabricated from materials that are not corrosive to sign materials and mounting surface.
- B. Tamper Resistant Standoff Supports: Subject to compliance with requirements, provide "SOK-8-100" by Gyford or comparable product with the following product characteristics, submitted to and accepted by Architect prior to bidding. Quantities as required to complete design as indicated on the Construction Drawings.
  - 1. Material: Anodized aluminum.
  - 2. Stud Dimensions: 5/8 inch diameter.
  - 3. Components:
    - a. SO-CAP8.
    - b. SO-100.
    - c. HD-S19.



- d. HD-CBS7.
- e. HD-FDA1.

## 2.4 FABRICATION

- A. General: Provide manufacturer's standard signs of configurations indicated.
  - 1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
  - 2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
  - 3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
  - 4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.
  - 5. Internally brace signs for stability and for securing fasteners.
  - 6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
  - 7. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing
- B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.
  - 1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish to match sign-background color unless otherwise indicated.

## 2.5 FLAT CUT - (101400.A31)

- A. General: Flat Cut
  - 1. Custom (101400.A31 - S07).
- B. Flat cut characters and shapes with uniform faces; square-cut, smooth, eased edges; precisely formed lines and profiles; and as follows:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. APCO Graphics, Inc.
    - b. R. K. Ramos Signage Systems.
    - c. ASI Sign Systems, Inc.
    - d. Dimensional Innovations.
    - e. Gemini Incorporated.
    - f. Metallic Arts.
    - g. Square One.
- C. Refer to Drawings for:
  - 1. Sign Height, Width and Depth.
  - 2. Typeface and Character Spacing.
  - 3. Color.
  - 4. Mounting Position.
- D. Mounting: Furnish inserts and other anchorage devices to connect masonry work. Coordinate anchorage devices with supporting structure.
  - 1. Fabricate anchorage devices that are capable of withstanding dead loads of units.
  - 2. Lettering shall be pin-mounted and stood off wall **1 inch** unless indicated otherwise.
- E. Refer to Article 2.1 "Materials" for material technical information.
- F. Refer to Article 2.2 "Finishes" for materials selected below.
- G. Material selection:
  - 1. ACRYLIC

- a. Fabricate flat-cut-out characters and shapes from sheet or plate cast acrylic with laminated metal facing.
- b. Finishes:
  - 1) Overcoat: Clear organic coating.
  - 2) Painted Edges: Paint edges of acrylic characters as recommended in writing by manufacturer.

## 2.6 FILM SIGNAGE

- A. Interior Film Graphic Over Smooth Substrate (101400.A40 - S06, S07, S08)
  - 1. Basis of Design Products: Subject to compliance with requirements, provide “**ScotchCal Graphic Film IJ180-10**” by 3M or a comparable product with the following criteria proposed to and accepted by Architect prior to bidding.
    - a. Material: Cast vinyl.
    - b. Color: White, opaque.
    - c. Thickness: 0.05 mm without adhesive.
    - d. Graphic Protection Layer: As selected by Architect and Owner from the following options.
      - 1) 3M Scotchcal Overlamine 8915 Ultra-Matte.
    - e. Adhesive type: Manufacturer’s standard releasable pressure sensitive adhesive.
    - f. Adhesive color: As selected by Architect from manufacturer’s full range.
    - g. Liner: Layflat polyethylene coated paper.
    - h. Chemical Resistance: Resists mild alkalis, mild acids, and salt. Excellent resistance to water.
    - i. Applied film shrinkage: 0.4 mm.
    - j. Artwork shall be furnished by the Owner, on disc to manufacturer’s standards.
- B. Interior Film Graphic Over Textured Substrate (101400.A41 - S01, S02, S03, S04, S05)
  - 1. Basis of Design Products: Subject to compliance with requirements, provide “**Envision Print Wrap Film SV480Cv3**” by 3M or a comparable product with the following criteria proposed to and accepted by Architect prior to bidding.
    - a. Material: High performance non-PVC polymer.
    - b. Color: White, opaque.
    - c. Thickness: 0.05 mm without adhesive.
    - d. Graphic Protection Layer: As selected by Architect and Owner from the following options.
      - 1) 3M Envision Overlamine 8550M Matte.
    - e. Adhesive type: Manufacturer’s standard releasable pressure sensitive adhesive.
    - f. Adhesive color: As selected by Architect from manufacturer’s full range.
    - g. Liner: Layflat polyethylene coated paper.
    - h. Chemical Resistance: Resists mild alkalis, mild acids, and salt. Excellent resistance to water.
    - i. Applied film shrinkage: 0.4 mm.
    - j. Artwork shall be furnished by the Owner, on disc to manufacturer’s standards.
    - k. Adhesive color: As selected by Architect from manufacturer’s full range.

## 2.7 PAINTED CUSTOM GRAPHICS (101400.61)

- A. Painted Graphic – Epoxy Paint (101400.A61 - S06)
  - 1. Precast substrate, concrete masonry unit.
- B. Contractor shall fabricate templates for installation of graphics artwork indicated on Construction Drawings. Paint products indicated shall be compatible for installation with template materials selected by signage fabricator.
  - 1. Artwork shall be furnished by the Owner, on disc by Architect for signage fabricator’s use.
  - 2. Refer to Section 099123 “Interior Painting” and Section 099600 “High Performance Coatings” for product requirements.
  - 3. Graphics indicated are to be installed on the following substrates:
  - 4. PG1 – Concrete substrates.
  - 5. PG2 – CMU substrates.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs.
- C. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Verify that items provided under other sections of Work are sized and located to accommodate signs.
- E. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.
- G. Field verify dimensions of all conditions.

### 3.2 INSTALLATION, GENERAL

- A. Preparation
  - 1. Acclimatize materials by removing them from packaging in the installation areas not less than 24 hours before installation.
  - 2. Follow manufacturer's printed instructions for surface preparation.
    - a. Prepare substrates to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, and defects.
    - b. Painted surfaces: Treat areas susceptible to pigment bleeding.
    - c. Metals: If not factory-primed, clean and apply rust inhibitive zinc primer.
    - d. Moisture content: maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
    - e. Adhesion Test: Perform manufacturer's standard non-destructive adhesion test on substrate, prime or repaint all surfaces that fail adhesion test as recommended by manufacturer.
- B. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
  - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
- C. Face Mounting: Mount plaques using exposed fasteners with rosettes attached through face of plaque into wall surface.
- D. Wall-Mounted Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.
- E. Wall-Mounted Signs on Smooth Surfaces: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
  - 1. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces. Where signage is located on exterior surfaces, provide exterior rated adhesive as recommended by signage manufacturer for substrate indicated.
- F. Wall-Mounted Signs on Textured Surfaces: Comply with sign manufacturer's written instructions except where more stringent requirements apply. Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
  - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
  - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
- G. Vertical Tolerance: Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1m).
- H. Installation – Film Signage
  1. Field-Applied, Vinyl-Film Signs:
    - a. Align sign Characters in final position before removing release liner. Remove release liner in stages, and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.
    - b. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

### 3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.
- B. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes to components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- C. Remove temporary protective coverings and strippable films as signs are installed.
- D. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean conditions during construction and protect from damage until acceptance by Owner.

END OF SECTION 101400

## **SECTION 101423 - ADA AND CODE SIGNAGE**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Wayfinding Panel Signage (101423.A04):
    - a. Interior Room signage.
- B. Related Sections include the following:
  - 1. Section 015000 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.

#### **1.2 DEFINITIONS**

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."
- B. Signage Contractor: Contractor responsible for the fabrication and installation of signage unless responsibility for fabrication or installation is called out by others in the drawings.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated. Including but not limited to, the following:
  - 1. Manufacturer's technical product data for each type of product specified. Include data on physical characteristics, durability, fade resistance, flame resistance and manufacturing process.
  - 2. Product data shall show compliance with requirements for fire performance characteristics and physical properties.
- B. Shop Drawings: Show fabrication and installation details for signs.
  - 1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
  - 2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
  - 3. Include fabrication and installation details, and attachments to other work.
  - 4. Include elevations, component details, and attachments to other work for wayfinding signage.
  - 5. Indicate materials and profiles of signage fittings, joinery, finishes, fasteners, anchorages, and accessory items.
  - 6. Field Dimensions shall be obtained, reviewed, and accepted by signage manufacturer prior to submittal of shop drawings.

- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:
  - 1. Aluminum.
- D. Samples for Verification:
  - 1. Sample from same flitch to be used for the Work, with specified finish applied.
  - 2. Submit full-size samples of wayfinding signage. Quantity and type shall be determined by Architect with intent of one sample per each signage type representative of all types of products indicated.
- E. Sign Schedule: Use same designations indicated on Drawings.
- F. Mockups/Field Samples: Build mockups/field samples to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Warranty: Special warranty specified in this Section.
- C. Provide written documentation that the braille translation included on the manufacturer's signage provided in this section has been evaluated by the American Foundation for the Blind, and is, in their opinion, correct and compliant with ADAAG.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Fabricator Qualifications: A firm that employs skilled workers experienced in producing custom-fabricated products similar to those required for this Project and with at least seven years continuous experience under the current company name. Fabricator shall have a record of successful in-service performance, as well as sufficient production capacity to produce required units.
  - 1. Fabricator shall have completed at least seven (7) similar signage projects having similar requirements within the last four (4) years for each signage type.
- C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
- D. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines.
- E. Fire Performance Characteristics: Provide wall coverings with the following surface burning characteristics as determined by testing identical products per ASTM E 84 by UL or other testing and inspecting organizations

acceptable to authorities having jurisdiction. Identify wall coverings with appropriate markings of applicable testing and inspecting organization.

1. Flame Spread: 5 or less.
2. Smoke Developed: 25 or less.

- F. ADA Accessibility Guidelines: Signage shall comply with the ADA Accessibility Guidelines where applicable. Characters and graphics, including but-not limited to, copy height, letter stroke symbols, materials, and finishes indicated on the Drawings are intended as guidelines for compliance. Implement each applicable ADA guideline. Should conflicts arise, notify the Designer before proceeding.

#### 1.7 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
1. Required parties include the contractor, sub-contractor and architect/designer.
  2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  3. Review temporary protection requirements for during and after installation.

#### 1.8 PROJECT CONDITIONS

- A. Interior Environmental Limitations: Do not deliver and install vinyl wall graphics until spaces are enclosed and weathertight, wet work in spaces to receive murals is complete and dry, work above ceilings is complete, and temporary or permanent HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
1. Maintain a constant temperature not less than 60 deg F in installation areas for at least 10 days before and 10 days after installation.
- B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

#### 1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install ADA and Code Signage units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

#### 1.10 DELIVERY, STORAGE AND HANDLING

- A. Use special care in handling to prevent twisting, warping, nicking, and other damage to signage. Store materials to permit easy access for inspection and identification.
- B. Store signage in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

## 1.11 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing signs.
- B. For signage furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.  
Deliver such items to Project site in time for installation.

## 1.12 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Deterioration of metal and polymer finishes beyond normal weathering.
    - b. Deterioration of embedded graphic image colors.
  - 2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.  
(1.6.H)

### 2.2 MATERIALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. Provide materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
  - 1. Plate and Sheet: ASTM B 209, Alloy 3003-H14, Alloy 5005-H32 or Alloy 6061-T6.
  - 2. Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.
  - 3. Extrusions: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- D. PETG (Polyethylene Terephthalate Glycol) Sheet: ASTM D 5047-17 category as standard with manufacturer for each sign.
  - 1. Tensile Strength: 7,700 lbf/sq. in. per ASTM D 638.
  - 2. Flexural Modulus of Elasticity: 310,000 lbf/sq. in. per ASTM D 790.



- E. Photopolymer Sheet: Manufacturer's recommended photopolymer for producing integral non-laminated raised copy.
- F. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, ASTM C 1349, Appendix X1, Type II (coated, mar-resistant, UV-stabilized polycarbonate), coated on both surfaces with abrasion-resistant coating:
  - 1. Impact Resistance: 16 ft-lbf/in. per ASTM D 256, Method A.
  - 2. Tensile Strength: 9000 lbf/sq. in. per ASTM D 638.
  - 3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. per ASTM D 790.
  - 4. Heat Deflection: 265 deg F at 264 lbf/sq. in. per ASTM D 648.
  - 5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.
- G. Expanded PVC Sheet: Subject to compliance with requirements, provide "Sintra" by 3A Composites.
  - 1. Material: Moderately expanded closed-cell polyvinyl chloride.
  - 2. Color: As selected by Architect from manufacturer's full range.
- H. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

### 2.3 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Aluminum Finishes
  - 1. Clear Anodic Finish: Manufacturer's standard Class 1 clear anodic coating, 0.018 mm or thicker, over a satin (directionally textured) mechanical finish, complying with AAMA 611.
- E. Acrylic Sheet Finishes
  - 1. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.

## 2.4 ACCESSORIES

- A. Mounting Methods: Use double sided vinyl tape and silicone adhesive fabricated from materials that are not corrosive to sign materials and mounting surface.
- B. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
  - 1. Use concealed fasteners and anchors unless indicated to be exposed.
  - 2. Exposed Metal-Fastener Components, General:
    - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
    - b. Fastener Heads: For nonstructural connections, use oval countersunk screws and bolts with tamper-resistant, Allen-head slots unless otherwise indicated.

## 2.5 FABRICATION

- A. General: Provide manufacturer's standard signs of configurations indicated.
  - 1. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
  - 2. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
  - 3. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.
  - 4. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Sign Message Panels: Construct sign-panel surfaces to be smooth and to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner.
  - 1. Increase panel thickness or reinforce with concealed stiffeners or backing materials as needed to product surfaces without distortion, buckles, warp, or other surface deformations.

## 2.6 WAYFINDING PANEL SIGNAGE – ROOM SIGNAGE (101423.A01)

- A. General: Panel signs shall be acrylic or photopolymer signs with insert window, with an overall thickness of approximately 5/16 inch. Existing signs were constructed as follows:
  - 1. Provide back sheet of 1/8 inch thick acrylic with first surface painted.
  - 2. Provide 1/16 inch spacer for insert window.
  - 3. Provide 1/8 inch thick photopolymer with first surface painted.
  - 4. Provide painted edges for solid appearance.
  - 5. Provide white raised numbers and braille, unless otherwise indicated or required by code.

- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Ad Trends.
  2. APCO Signs
  3. ASI Sign Systems, Inc.
  4. Gemini
  5. Howard Industries
  6. Innerface Architectural Signage, Inc.
  7. Modulex
  8. Nova Polymers.
  9. Take Form.
  10. 2/90 Sign Systems.
- C. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.
- D. Changeable Message Inserts: Fabricate signs to allow insertion of changeable messages in the form of slide-in inserts.
- E. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
1. Raised-Copy Thickness: Not less than 1/32 inch.
- F. Subsurface Copy: Apply minimum 4-mil- thick vinyl copy to back face of clear acrylic sheet forming panel face to produce precisely formed opaque image. Image shall be free of rough edges.
- G. Colored Coatings for Acrylic Sheet: For copy background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are UV and water resistant for five years for application intended.
1. Color: As selected by Architect from manufacturer's full range.
- H. Sign Types – General: There will be one type with tactile/Braille to match existing interior signage to best extent possible as acceptable to Architect.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs.
- C. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Verify that items provided under other sections of Work are sized and located to accommodate signs.
- E. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.
- G. Field verify dimensions of all conditions.

### 3.2 INSTALLATION, GENERAL

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
  - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
- B. Wall-Mounted Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.
- C. Wall-Mounted Signs on Smooth Surfaces: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
  - 1. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces. Where signage is located on exterior surfaces, provide exterior rated adhesive as recommended by signage manufacturer for substrate indicated.
- D. Wall-Mounted Signs on Textured Surfaces: Comply with sign manufacturer's written instructions except where more stringent requirements apply. Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
  - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
  - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
- E. Vertical Tolerance: Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1m)

### 3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.
- B. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes to components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- C. Remove temporary protective coverings and strippable films as signs are installed.
- D. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean conditions during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423



## **SECTION 104413 - FIRE EXTINGUISHER CABINETS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

**1. Fire protection cabinets for the following:**

**a. Portable fire extinguishers.**

- 1) Provide fire extinguishers for each fire extinguisher cabinet, except where indicated as bracket-mounted.**

**B. Related Requirements:**

**1. Section 104416 "Fire Extinguishers."**

#### **1.2 ACTION SUBMITTALS**

**A. Product Data:** For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.

**1. Fire Protection Cabinets:** Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

**B. Shop Drawings:** For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

#### **1.3 CLOSEOUT SUBMITTALS**

**A. Maintenance Data:** For fire protection cabinets to include in maintenance manuals.

#### **1.4 COORDINATION**

**A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.**

**1. Coordinate sizes and locations of fire protection cabinets with wall depths**

#### **1.5 SEQUENCING**

**A. Apply vinyl lettering on field-painted, fire protection cabinets after painting is complete.**

### **PART 2 PRODUCTS**

#### **2.1 MATERIALS**

**A. Cold-Rolled Steel Sheet:** ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

**1. Finish:** Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.

**a. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.**

**b. Color:** As selected by Architect from manufacturer's full range.

**B. Aluminum:** Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209 (ASTM B 209M).
  2. Extruded Shapes: ASTM B 221 (ASTM B 221M).
- C. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

## 2.2 FIRE PROTECTION CABINET (104413.A01)

A. Cabinet Type: Suitable for fire extinguisher.

1. Basis of Design Products: Subject to compliance with requirements provide:

a. Semi-Recessed Non-rated Cabinets: Larsen's Manufacturing Company; Architectural Series, Model AL-2409-6R.

- 1) Comparable products from the following meeting specified requirements:
  - (a) J. L. Industries, Inc., a division of Activar Construction Products Group.
  - (b) Potter Roemer LLC.

B. Cabinet Construction:

1. Type: Nonrated.

C. Cabinet Material: Steel sheet.

1. Shelf: Same metal and finish as cabinet.

D. Semi-recessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semi-recessed cabinet installation.

1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

E. Cabinet Trim Material: Same material and finish as door.

F. Door Material: Aluminum.

G. Door Style: Vertical duo panel with frame.

H. Door Glazing: Tempered break glass, clear.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting door pull and friction latch.

2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

J. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.

a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."

- 1) Location: Applied to cabinet door.



- 2) Application Process: Pressure-sensitive vinyl letters.
  - 3) Lettering Color:
    - (a) White
  - 4) Orientation: Vertical.
- K. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:

- L. Interior of cabinet.

1. Aluminum Door and Trim: Match existing fire extinguisher door face finish.

## 2.3 FABRICATION

- A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
  2. Provide factory-drilled mounting holes.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
1. Fabricate door frames of one-piece construction with edges flanged.
  2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

## 2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.5 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning". After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- B. Baked-Enamel or Powder-Coat Finish: Interior box finish, immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness

of 2 mils.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

## 2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare recesses for semi-recessed fire protection cabinets as required by type and size of cabinet and trim style.

### 3.3 INSTALLATION

- A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
  1. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.
  2. Fire-Rated, Cabinets:
    - a. Install cabinet with not more than 1/16 inch tolerance between pipe OD and knockout OD. Center pipe within knockout.
    - b. Seal through penetrations with firestopping sealant as specified in Division 07 Section "Penetration Firestopping."
- C. Identification: Apply vinyl lettering at locations indicated.

### 3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- C. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- D. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

## **SECTION 104416 - FIRE EXTINGUISHERS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

#### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.

#### **1.3 INFORMATIONAL SUBMITTALS**

- A. Warranty: Sample of special warranty.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Operation and maintenance data.

#### **1.5 COORDINATION**

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

#### **1.6 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Six years from date of Substantial Completion.

### **PART 2 PRODUCTS**

#### **2.1 PERFORMANCE REQUIREMENTS**

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

#### **2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS**

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Amerex Corporation.
    - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
    - c. Larsens Manufacturing Company.
    - d. Potter Roemer LLC.
  - 2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type (104416.A01): UL-rated 3-A:40-B:C, 5 lbs. nominal capacity, with mono-ammonium phosphate-based dry chemical in manufacturer's standard enameled container.

## 2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
  - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
  - 1. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

## **SECTION 122413 - ROLLER WINDOW SHADES**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes the following types of roller shades:
  - 1. Manually operated roller shades with single rollers (122413.A01).
- B. Related Sections include the following:
  - 1. Section 012300 "Alternates" for alternates effecting work of this Section.
  - 2. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

#### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations. Show location and type of each roller shade.
  - 1. Include elevations, sections details, and dimensions not shown in Product Data.
  - 2. Include operational clearances, attachments to and relationship to adjoining work.
- C. Samples for Initial Selection: For each type and color of shadeband material.
  - 1. Include Samples of accessories involving color selection.
  - 2. Include 4 inch square, actual samples of each type of shadeband material for Architect's selection.
- D. Samples for Verification: For each type of roller shade.
  - 1. Shadeband Material: Not less than 10 inches square. Mark interior face of material if applicable.
  - 2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
  - 3. Installation Accessories: Full-size unit, not less than 10 inches long.

#### **1.3 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of shadeband material.
- C. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
  - 1. Methods for maintaining roller shades and finishes.

2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
3. Operating hardware.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Source Limitations: Obtain roller shades through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
  1. Flame-Resistance Ratings: Passes NFPA 701.
- D. Product Standard: Provide roller shades complying with WCMA A 100.1.
- E. Anti-Microbial Characteristics: 'No Growth' per ASTM G21 results for fungi ATCC9642, ATCC9644 AND ATCC9645.
- F. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory packages, marked with manufacturer and product name, lead-free designation, and location of installation using same designations indicated on Drawings.

#### 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

## 1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Roller Shades: Full-size units equal to 2 percent of quantity installed for each size, color, and shadeband material indicated, but not fewer than two units.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product for Manually Operated Roller Shades (122413.A01): Subject to compliance with requirements, provide MechoShade Systems, Inc.; "Mecho/5 Slimline" or a comparable product by one of the following:
  - 1. Draper Inc.
  - 2. Lutron Electronics Company, Inc.
  - 3. Springs Window Fashions.
- B. Source Limitations: Obtain roller shades from single source from single manufacturer.

### 2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS (122413.A01)

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
  - 1. Bead Chains: Stainless steel with Shock Absorber System.
    - a. Loop Length: Full length of roller shade.
    - b. Limit Stops: Provide upper and lower ball stops.
      - 1) Provide limit stops with Shock Absorber System reducing chain stress, consisting of a  $\frac{3}{4}$ " rubber sleeve,  $\frac{3}{8}$ " stop beads and washers to prevent shade from being raised or lowered too far.
      - 2) Clutch mechanism: Fabricated from POM thermoplastic with welded 0.354 inch (9 mm) primary steel post with rotational bearing, overrunning design, and positive mechanical engagement of drive mechanism to tube. White or Black color as selected by Architect. Center bead chain placement for right or left hand operation and accommodates side channel with no adjustment of chain location.
    - c. Chain-Retainer Type: Chain tensioner, jamb mounted.
  - 2. Spring Lift-Assist Mechanisms: When recommended by roller shade manufacturer for proper operation of shade, provide manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
    - a. Provide for shade bands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shade bands indicated without deflection.

Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shade bands for service.

  - 1. Roller Drive-End Location: Right side of inside face of shade or left side of inside face of shade as determined by Architect.

2. Direction of Shadeband Roll: Regular, from back of roller.
  3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- E. Shadebands:
1. Shadeband Material: Light-filtering fabric.
  2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
    - a. Type: Enclosed in sealed pocket of shadeband material.
- F. Installation Accessories:
1. Exposed Headbox:
    - a. Description: Rectangular, extruded-aluminum enclosure including the following:
      - 1) Front fascia with integral bottom closure.
      - 2) Top and back covers.
      - 3) Endcaps.
    - b. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 3 inches.
  2. Endcap Covers: As required by manufacturer, provide to cover exposed endcaps.
  3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

### 2.3 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide MechoShade Systems, Inc.; "ThermoVeil" Dense Basket Weave 1300 Series or Dense Linear Weave 1000 Series as determined by Architect, or comparable product from other roller shade manufacturers submitted to and accepted by Architect prior to bidding.
- C. Light-Filtering Fabric: Visually transparent, woven non-raveling single-fabric, stain and fade resistant shadecloth.
1. Source: Roller-shade manufacturer.
  2. Type: Woven from extruded vinyl yarn comprised of 21 percent polyester and 79 percent reinforced vinyl.
  3. Thickness: 0.030 inch.
  4. Weight: Manufacturer's standard.
  5. Roll Width: Manufacturer's standard width up to 126 inches.
  6. Orientation on Shadeband: As indicated on Drawings.
  7. Openness Factor: 3 percent.
  8. Color: As selected by Architect from manufacturer's full range.



## 2.4 ROLLER SHADE FABRICATION

- A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.
- B. Concealed Components: Non-corrodible or corrosion-resistant-coated materials.
  - 1. Lifting Mechanism: With permanently lubricated moving parts.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
  - 1. Shade Units Installed Outside Jamb: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting headbox, roller, and operating hardware and for hardware position and shade mounting method indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.
- F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- G. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range, unless otherwise indicated.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions and located so shade band is not closer than 4 inches to interior face of glass. Allow clearances for window operation hardware.

### 3.3 ADJUSTING, CLEANING AND PROTECTION

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

- B. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- D. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

#### 3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 122413

## **SECTION 123200 - MANUFACTURED WOOD CASEWORK**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Music Casework (123200.A15)
2. Filler and closure panels.

**B. Related Sections:**

1. Section 061000 "Rough Carpentry" for wood blocking for anchoring manufactured wood casework.
2. Section 092116 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring casework.
3. Section 096513 "Resilient Base and Accessories" for resilient base applied to manufactured wood casework.

#### **1.2 DEFINITIONS**

**A. Definitions in the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" apply to the work of this Section.**

**B. Balanced Construction:** Where exposed face of a panel is surfaced with high pressure plastic laminate and the opposite (back) surface shall receive a balanced product equal in thickness to the face of the panel.

1. Note: Color for interior is not required to match color and pattern of exterior face laminate.

**C. Casework:** Modular casework of this Section is that which is pre-manufactured to standard dimensions or sizes.

Casework fabricated as part of Section 064023 "Interior Architectural Woodwork" is that which is custom fabricated to suit a particular project.

**D. Concealed Portions of Cabinets:** Surfaces not usually visible after installation, including sleepers, web frames, dust panels, and ends and backs that are placed directly against walls or other cabinets.

**E. MDF:** Medium-density fiberboard.

**F. Hardwood Plywood:** A panel product composed of layers or plies of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive, and faced both front and back with hardwood veneers.

**G. Exposed Portions of Cabinets:** Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and surfaces visible in open cabinets and behind glass doors.

1. Ends of cabinets installed directly against walls or other cabinets shall not be considered as exposed.

**H. Semi-exposed Portions of Cabinets:** Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches or more above floor

are defined as semi-exposed.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, submit data describing materials, fabrication, hardware accessories, and installation instructions.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Indicate types, sizes and finishes of cabinets and countertops.
  - 2. Indicate types and locations of hardware.
  - 3. Indicate locations and types of service fittings.
  - 4. Show fabrication details; including locations and sizes for cutouts and holes for plumbing fixtures, science equipment and other items installed in casework.
  - 5. Indicate locations of blocking and reinforcements required for installing casework.
  - 6. Include details of utility spaces showing supports for conduits and piping.
  - 7. Show installation details, including field joints and filler panels.
  - 8. Indicate locations of and clearances from adjacent walls, doors, windows and other building components.
  - 9. As applicable, indicate manufacturer's catalog numbers for casework.
- C. Samples for Initial Selection: For cabinet finishes and for each type of top material indicated.
- D. Samples for Verification: 8-by-10-inch Samples for each type of finish, including top material.
  - 1. Exposed hardware, one unit for each type.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer. Furnish qualification data for Installer, if different from manufacturer.
- B. Keying Schedule: Include schematic keying diagram and index each key set to unique designations that are coordinated with the Contract Documents.
- C. Certifications: Submit documentation verifying use of "No added formaldehyde" and "marine grade plywood" were incorporated into the work of this Section, as acceptable to and when requested by Architect.
- D. Warranty: Sample of special warranty.

### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer with not less than seven years of successful experience, under the current company name, in producing manufactured casework similar to that required for this Project.
- B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

- D. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project. Installer must have completed projects of similar size and scope to this project in the last 5 years.
- E. Source Limitations: Obtain manufactured wood casework from single source from single manufacturer.
- F. Quality Standard: Unless otherwise indicated, comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.
  - 1. Grade: Custom.
  - 2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
- G. Product Designations: Drawings indicate sizes, configurations, and finish material of manufactured wood casework. Other manufacturers' casework of similar sizes and door and drawer configurations, of same finish material, and complying with the Specifications may be considered as noted below. Refer to Section 012500 "Substitution Procedures" and Section 016000 "Product Requirements."
  - 1. Other manufacturers proposing comparable products shall submit the following for Architect's verification:
    - a. One full-size finished base cabinet complete with hardware, doors, and drawers.
    - b. One full-size finished wall cabinet complete with hardware, doors, and adjustable shelves.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver manufactured wood casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified in "Project Conditions" Article.
- B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install manufactured wood casework until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of construction contiguous with manufactured wood casework by field measurements before fabrication.

1. Casework manufacturer is responsible for details and dimensions not controlled by job conditions. Show all required field measurements beyond manufacturer's control on shop drawings.
2. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.

#### 1.8 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements in walls and partitions for support of manufactured wood casework.
- B. Coordinate installation of laboratory casework with installation of fume hoods and other laboratory equipment.
- C. Coordinate layout and installation of work of this Section with electrical and plumbing contractors. Coordinate installation so as not to interfere with plumbing and electrical work associated with casework.
- D. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying requirements.

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of manufactured wood casework that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Delamination of components or other failures of glue bond.
    - b. Warping of components.
    - c. Failure of operating hardware.
    - d. Deterioration of finishes.
  2. Warranty Period: Three years from date of Substantial Completion.

### PART 2- PRODUCTS

#### 2.1 MATERIALS, GENERAL

- A. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
- B. Softwood Plywood: DOC PS 1, with no added formaldehyde (NAUF).
- C. Particleboard: ANSI A208.1, Grade M-2, with no added formaldehyde (NAUF).
- D. MDF: ANSI A208.2, Grade 130, with no added formaldehyde (NAUF).
- E. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.
  1. Colors: Refer to Material Finish Legend on drawings for basis of design products.
- F. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
- G. Edge Banding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors, drawer fronts and laminate countertops, 1 mm thick elsewhere.
  1. 3mm edge banding shall be machine-applied and set with hot-melt glue.

2. Edge banding colors shall match a solid color of adjacent laminate surface, unless noted otherwise, as determined by Architect. Colors shall not be limited to casework manufacturer's standard stocked colors, but will be selected by Architect from any color group offered by Canplast, Rehau and Doellken-Woodtape.
- H. Edgebanding for Thermoset Decorative Panels: Unless otherwise specified, provide PVC or polyester edge banding complying with LMA EDG-1 and matching thermoset decorative panels.

## 2.2 CABINET MATERIALS

### A. Exposed Cabinet Materials:

1. Plastic Laminate: Grade HGS for horizontal surfaces and VGS for vertical surfaces.
2. Unless otherwise indicated, provide specified edge banding on all exposed edges.

### B. Semiexposed Cabinet Materials:

1. Plastic Laminate: Grade VGS.
  - a. Provide plastic laminate for semi-exposed surfaces unless otherwise indicated.
    - 1) Color for backs of doors and drawers shall match a solid color of that of cabinet box interior, as determined by Architect. Facings shall be balanced as required by AWI construction guidelines for grade level indicated.
2. Unless otherwise indicated, provide specified edge banding on all semi-exposed edges.

### C. Concealed Cabinet Materials:

1. Thermoset decorative panels.

### D. Base and Wall Cabinets (123200.A01): Drawings indicate sizes, configurations, and finish material of manufactured wood casework.

## 2.3 DESIGN, COLOR, AND FINISH

### A. Design: Provide manufactured wood casework of the following design:

1. Flush overlay.

### B. Thermoset Decorative Panel Colors, Patterns, and Finishes: As selected by Architect from casework manufacturer's full range.

### C. Plastic-Laminate Colors, Patterns, and Finishes: Coordinate finishes with existing casework. Match Architects sample.

### D. PVC Edgebanding Color: As selected from casework manufacturer's full range, including pre-formulated colors.

## 2.4 CABINET FABRICATION

### A. Plastic-Laminate-Faced Cabinet Construction: As required by referenced quality standard, but not less than the following:

1. Assembly method for cabinets shall utilize "European" assembly screws (threaded steel dowel pins), similar to Hafele "Conformat". At manufacturer's option, alternate doweled assembly methods may be used if in accordance with AWI guidelines and requirements for grade level indicated.

2. Cabinets boxes below sinks shall be fabricated from plywood and shall receive white plastic laminate on the interior.
  3. Bottoms and Ends of Cabinets, and Tops of Wall Cabinets and Tall Cabinets: 3/4-inch particleboard, plastic-laminate faced on exposed surfaces, thermoset decorative panels on semi-exposed surfaces.
  4. Shelves: Thermoset decorative panels; 3/4-inch thick for spans up to 32 inches and 1-inch thick for spans up to 48 inches.
  5. Backs of Cabinets: 1/2-inch particleboard or 1/4-inch MDF, plastic-laminate faced on exposed surfaces, thermoset decorative panels on semi-exposed surfaces. Backs shall be captured in a 1/2-inch dado and set back 3/4-inch to accommodate 3/4-inch thick nailers.
  6. Drawer Fronts: 3/4-inch particleboard, plastic-laminate faced exposed face and balanced backer.
  7. Drawer Sub-fronts, Sides and Backs:
    - a. 1/2 solid-wood or veneer-core hardwood plywood, with glued dovetail or multiple dowel joints.
    - b. 1/2-inch, high density fiberboard, 55 pcf density minimum. All parts glued and mechanically fastened using thermosetting fasteners.
    - c. 1/2-inch, high density melamine composite panels. All parts glued and mechanically fastened using thermosetting fasteners.
  8. Drawer Bottoms: 1/4-inch thermoset decorative panels glued and dadoed into front, back, and sides of drawers. Use 1/2-inch material for drawers more than 24 inches wide.
  9. Doors: 3/4-inch particleboard or MDF, plastic-laminate faced.
  10. Removable Backs: Provide backs that can be removed from within cabinets at utility spaces.
  11. Cabinets Bases: Bases shall be fabricated separate from cabinets (not integral). Fabricate from 3/4-inch exterior marine grade plywood or preservative-treated 2x4's with marine-grade plywood face. Fabricate in a ladder configuration with plywood fronts and back running continuous for the length of the cabinet. Provide ends, and provide additional runners centered in all cabinets greater than 24 inches wide.
- B. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.
1. Provide top and bottom fillers and corner panels to close gaps and openings.

## 2.5 CASEWORK HARDWARE AND ACCESSORIES

- A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.
  1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.
  2. Provide caps on fasteners at cabinet interiors in color to match adjacent cabinet finish color.
- B. Butt Hinges: Chrome-plated, semiconcealed, 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and hospital tips. Provide 2 hinges for doors less than 48 inches high and 3 hinges for doors



more than 48 inches high.

1. If installed adjacent to casework specified in 064023 refer to architect to see which hinge type takes precedence.

C. Pulls: Solid aluminum or chrome-plated wire pulls, fastened from back with two screws. Provide 2 pulls for drawers more than 24 inches wide.

D. Door Catches: Zinc-plated, dual, self-aligning, permanent magnet catch. Provide 2 catches on doors more than 48 inches high.

E. Drawer Slides: BHMA A156.9, Type B05091.

1. Heavy Duty (Grade 1HD-100): Side mounted; full-extension type; zinc-plated, steel ball-bearing slides. Provide with manufacturer's standard metal rear brackets as applicable.

a. Basis-of-Design: GSlide Corporation/Knape & Vogt Mfg. Co.; #GS4200.

F. Adjustable Shelf Supports: 2-pin locking plastic shelf rests complying with BHMA A156.9, Type B04013.

G. Drawer and Hinged Door Locks: Provide cam-type locks by COMPX Timberline.

1. Provide a minimum of two keys per lock and six master keys.
2. Provide locks on all doors and drawers.
3. Inactive door shall receive barrel bolt and strike plate.

H. Coat Hooks (123200.A19): Cast aluminum with A14, bright nickel finish. Provide double wardrobe hook, similar to Ives #582.

## 2.6 MUSIC CASEWORK (123200.A15)

A. Basis-of-Design Products: Subject to compliance with requirements, provide "UltraStor Storage Cabinets" music casework as manufactured by Wenger Corporation. Comparable products from other manufacturers including but not limited to those listed below, that meet specified requirements and having same casework indicated will be considered when submitted to and accepted by Owner and Architect prior to bidding.

1. Stevens Industries, Inc.

2. Marco Group.

3. Melhart Music.

4. Instrument Storage Casework

a. General: Provide instrument storage casework meeting requirements as noted.

- 1) AcoustiCabinets" by Wenger indicated by manufacturer's designations.

- 2) Finish: Material Finish Legend PL3, Plastic Laminate is Custom from Wegner's standards finish options.

- 3)

5. Casework Panel Color: As selected by Architect from manufacturer's full range.

a. Frame: Oyster.

b. Door Panels: Maple.

6. Warranty: 10 year.

B. Storage Cabinets:

1. General: Provide instrument storage casework meeting requirements as noted.
  - a. Type 2: Match Wenger #2; Compartment 27 1/2" w x 29 1/4" d x 85-5/8" h.
    - 1) Stores 15 clarinets, flutes, piccolos or oboes.
  - b. Type 4: Match Wenger #4; Compartment 27 1/2" w x 29 1/4" d x 85-5/8" h.
    - 1) Stores 10 trumpets, cornets or alto saxophones.
  - c. Type 5: Match Wenger #5; Compartment 27 1/2" w x 39 1/4" d x 85-5/8" h.
    - 1) Stores 10 trombones, bassons, bass clarinets, viols, violas, tenor saxophones or alto clarinets.
  - d. Type 10: Match Wenger #10; 3 Compartment 27 1/2" w x 29 1/4" d x 85-5/8" h.
    - 1) Stores 3 french horns, alto horns or snare drums.
  - e. Type 11: Match Wenger #11; 3 Compartment 27 1/2" w x 39 1/4" d x 85-5/8" h.
    - 1) Stores 3 baritones, euphoniums or mellophones.
  - f. Type 12: Match Wenger #12; 3 Compartment 48 1/2" w x 29 1/4" d x 85-5/8" h.
    - 1) Stores 3 baritone saxophones, bass clarinets, bassoons, field drums, or snare drums or use for general storage.
  - g. Type 54: Match Wenger #54; 3 Compartment 27 1/2" w x 29 1/4" d x 38-5/16" h.
    - 1) Stores 4 trumpets, cornets or alto saxophones.
  - h. High Density Storage: 173G700 - Standard 7 shelf unit.

C. Music Library System:

1. General: Provide through-ventilating instrument storage casework meeting requirements as noted "Music Library System" by Wenger indicated by manufacturer's designations on Drawings.
  - a. Wenger #173G600; Standard width 6-shelf unit.
    - 1) Accessories: Provide end cover, Wenger #173G011, Oyster.
  - b. Side Panels and Divider Panels: Particleboard thermoset panel with no urea formaldehyde added, 3/4 inch thick. Side panels machined to accept unit to unit through bolting.
  - c. Panel Doors: Particleboard thermoset panel with no urea formaldehyde added, 3/4 inch thick, inset-type. Color as selected by Architect from manufacturer's full range.
  - d. Open Casework: Provide open casework without doors.
  - e. Panel Edge Banding: 3 mm thick, heat bonded, with radiused and profiled edges and corners.
  - f. Shelving: Sized with adequate gap between shelving and casework side panels to allow air movement inside casework.
    - 1) Up to 27 inches wide: Removable molded polyethylene shelf, with impact-resistant, radiused front edge, mounted to cabinet wall with self-locking clip.
2. Casework Panel Color: As selected from manufacturer's full range of colors and finishes.

2.7 MUSIC ROOM CASEWORK

A. Music Storage Casework

1. Basis of Design: Subject to compliance with requirements, provide "Ultrastor" or "AcoustiCabinets" by Wenger or a comparable product by a manufacturer listed below:
2. Stringed Instrument Mobile Storage Racks
  - a. Basis of Design Products: Subject to compliance with requirements, provide Wenger Models below or a comparable product approved by the Architect.
    - 1) Four-unit String Bass Rack, 148J004
    - 2) Six-unit Cello Rack, 148J002
3. Multi-Compartment Storage Cabinets

B. Metal Wall Anchored Bracket Shelving

1. Basis of Design Products: Subject to compliance with requirements, provide product by Wenger or a comparable product submitted to and approved by the Architect.
  - a. GearBoss Shelving: No. 241C025 Shelf Starter Bay, 48" wide x 96" high.
  - b. GearBoss Shelving: No. 241C026 Shelf Add-on Bay, 48" wide x 96" high.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of manufactured wood casework.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 CASEWORK INSTALLATION

- A. General: Install cabinets to comply with same grade as item to be installed.
- B. Install level, plumb, and true; shim as required, using concealed shims. Where manufactured wood casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- C. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Fasten cabinets to masonry or framing, wood blocking, or reinforcements in walls and partitions with fasteners spaced 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.
  - 1. Where base cabinets are not installed adjacent to walls, fasten to floor at toe space with fasteners spaced 24 inches o.c. Secure sides of cabinets to floor, where they do not adjoin other cabinets, with not less than two fasteners.
- D. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, or framing, blocking, or reinforcements in walls or partitions. Align similar adjoining doors to a tolerance of 1/16 inch.
  - 1. Fasten through back, near top and bottom, at ends, and not more than 16 inches o.c.
  - 2. Use toggle bolts at hollow masonry.
  - 3. Use expansion anchors at solid masonry.
  - 4. Use No. 10 wafer-head screws sized for 1-inch penetration at wood hanging strips.
  - 5. Use No. 10 wafer-head screws sized for 1-inch penetration into wood blocking.
  - 6. Use No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish at metal-framed partitions.
- E. Fasten cabinets to adjacent cabinets and to masonry, framing, wood blocking, or reinforcements in walls and partitions to comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
- F. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

- G. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

### 3.3 CLEANING AND PROTECTING

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- C. Protection: Provide 6-mil plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 123200

## **SECTION 123666 - SOLID SURFACING COUNTERTOPS**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Solid surface material sills (123666.A05).

**B. Related Requirements:**

1. Section 061000 "Rough Carpentry" for blocking as required.
2. Section 079200 "Joint Sealants" for countertop sealants.

#### **1.2 DESCRIPTIONS OF WORKS**

- A.** The solid surfacing subcontractor shall furnish, deliver, set in place, and make ready to use all solid surfacing and related items/materials as herein specified in the rooms scheduled.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data:** For each type of product indicated, submit data describing materials, fabrication, hardware accessories, and installation instructions.

- B. Shop Drawings:** Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures, as applicable.

1. Show direction of directional pattern, if any.

- C. Samples for Initial Selection:** For each type of material exposed to view.

- D. Samples for Verification:** For the following products:

1. Sill material, 6 inches square.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data:** For fabricator.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance Data:** For solid surface material to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

#### **1.6 QUALITY ASSURANCE**

- A. Fabricator Qualifications:** Shop with not less than seven years of experience, under the current company name, that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

- B. Installer Qualifications:** Fabricator of products or manufacturer's authorized representative who is trained and approved for installation of units required for this Project. Installer must have completed 7 projects of similar size

and scope to this project in the last 5 years.

#### 1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Protect solid surfacing during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver solid surfacing, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate solid surfacing which have been completed in installation areas

#### 1.8 FIELD CONDITIONS

- A. Field Measurements: Where work of this Section is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Verify dimensions by field measurements before fabrication is complete.

#### 1.9 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements in walls and partitions for support of work of this Section.

### PART 2 PRODUCTS

#### 2.1 SOLID SURFACE COUNTERTOP AND SILL MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
  - 1. Type: Provide Standard type unless Special Purpose type is indicated.
  - 2. Colors, Patterns, and Finishes: Sill shall be of the same material and color. Architect may select a separate color for each room. Provide materials and products that result in colors of solid-surfacing material as selected by Architect from manufacturer's full range of standard options.
- B. Particleboard: ANSI A208.1, Grade M-2, except at countertops with sinks and sills at exterior windows, provide Grade M-2-Exterior Glue.

#### 2.2 FABRICATION

- A. Fabricate countertops and sills according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
  - 1. Grade: Premium.
- B. Configuration:
  - 1. Sills: Straight, slightly eased at top with built-up front edge.
    - a. Fabricate from 1/2-inch- thick, solid surface material with front edge built up with same material.
- C. Fabricate in one piece, unless otherwise indicated. Comply with solid surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
- D. Joints: Fabricate countertops (up to 10 feet in length) without joints.

## 2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
- B. Sealant for Countertops and Sills: Comply with applicable requirements in Section 079200 "Joint Sealants."
- C. Accessories: Comply with manufacturer's recommendations for hardware, non-corrosive fasteners, adhesives, sealers, fabrication and finishing.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates to receive solid surface material countertops/sills and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install countertops and sills level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Apply sealant to gaps at walls and storefront/windows; comply with Section 079200 "Joint Sealants."

END OF SECTION 123666

